SEPTEMBER 1, 1993
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SEVEN DOLLARS

CIO

THE MAGAZINE FOR INFORMATION EXECUTIVES

COVER STORY

Seeing The Light

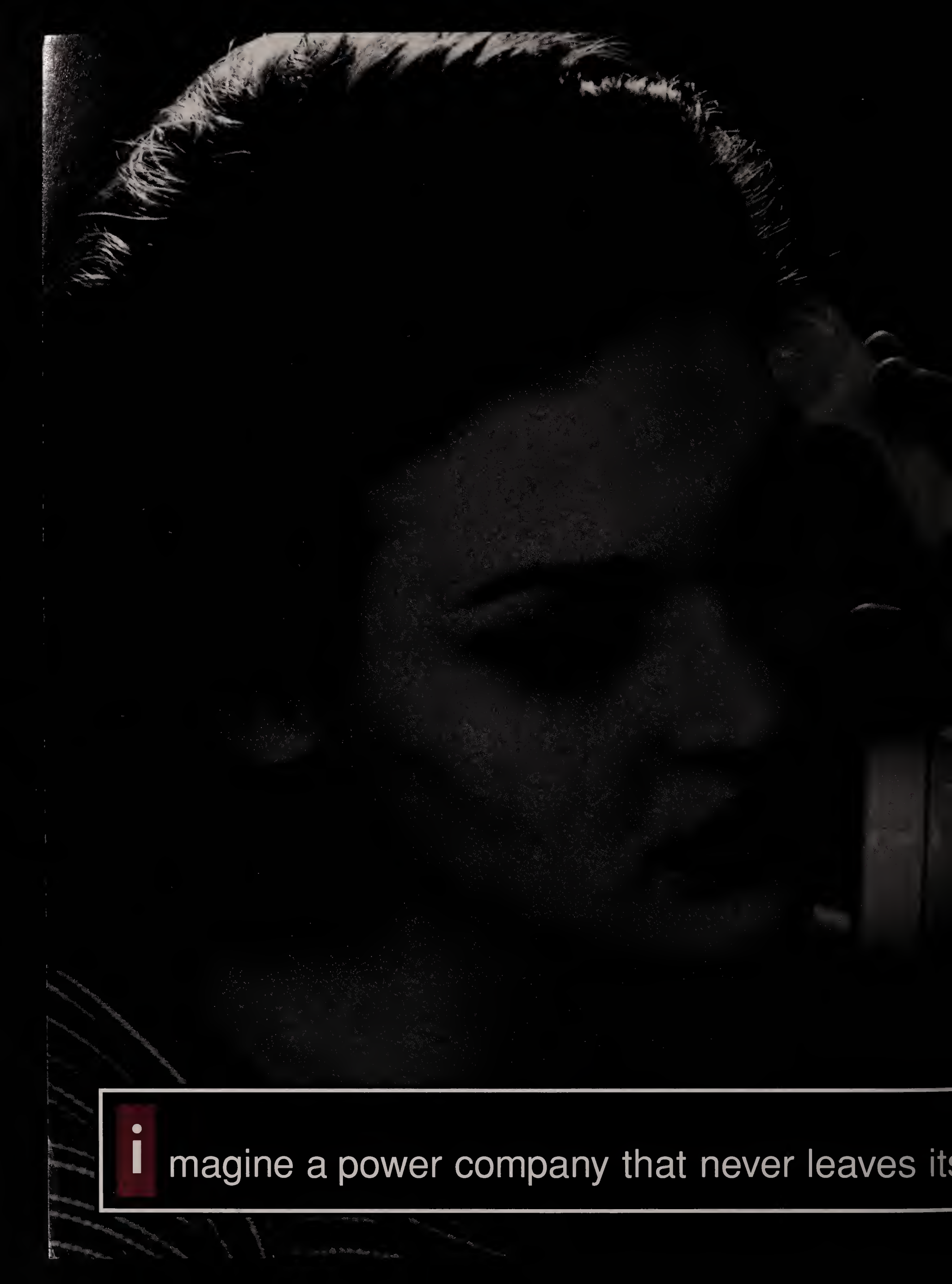
Why GE Needs A CIO

Second Opinions:

Expert Advice On Managing Client/Server

GE's Hellene Runtagh

AN INTERNATIONAL DATA GROUP PUBLICATION



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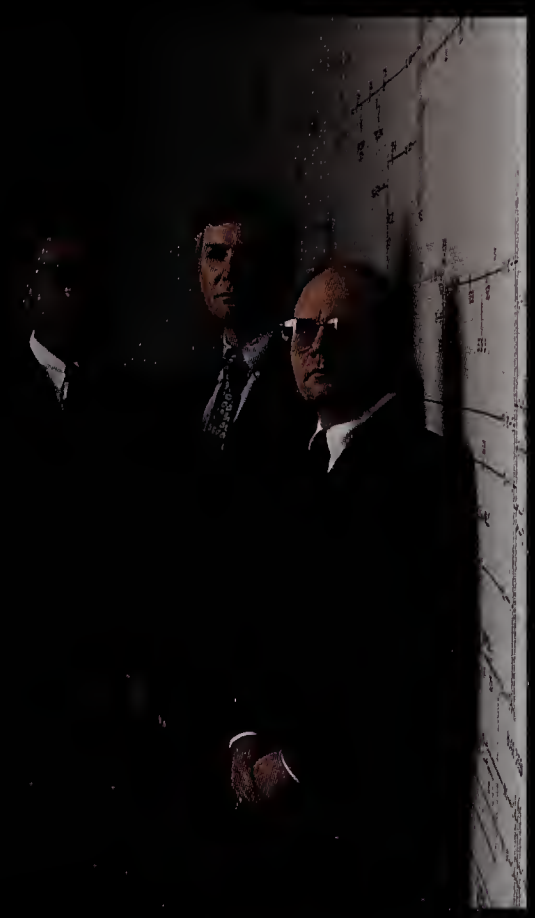

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VOLUME 6, NUMBER 17

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GE's New Leading Light

According to Hellene Runtagh, her appointment last year as GE's first CIO reflects a growing belief that superior information management will be central to the company's future success.

By Thomas Kiely

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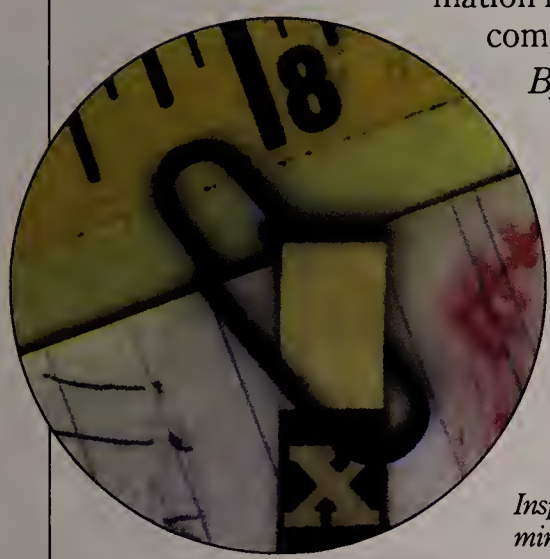
Cover photo by Katherine Lambert



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E.I. du Pont de Nemours & Co. is using some unusual techniques to tap into its employees' creative potential in new and focused ways. *CIO* sits in on a two-day session where creativity techniques are used as a reagent to stimulate innovation.

By Thomas Kiely

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A Controlling Interest

Centralized management of distributed systems is a frustratingly elusive goal for those taking the client/server plunge. While some vendors offer tools, most packages are limited. In this month's "Second Opinions," five seasoned executives offer advice to a CIO in the process of migrating to a distributed Unix environment.

By Richard Pastore

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Building Bridges

Looking for employees with strong technical backgrounds, business smarts and excellent interpersonal skills? At Syracuse University, training students to fill "bridge" positions is an academic imperative.

By Megan Santosus

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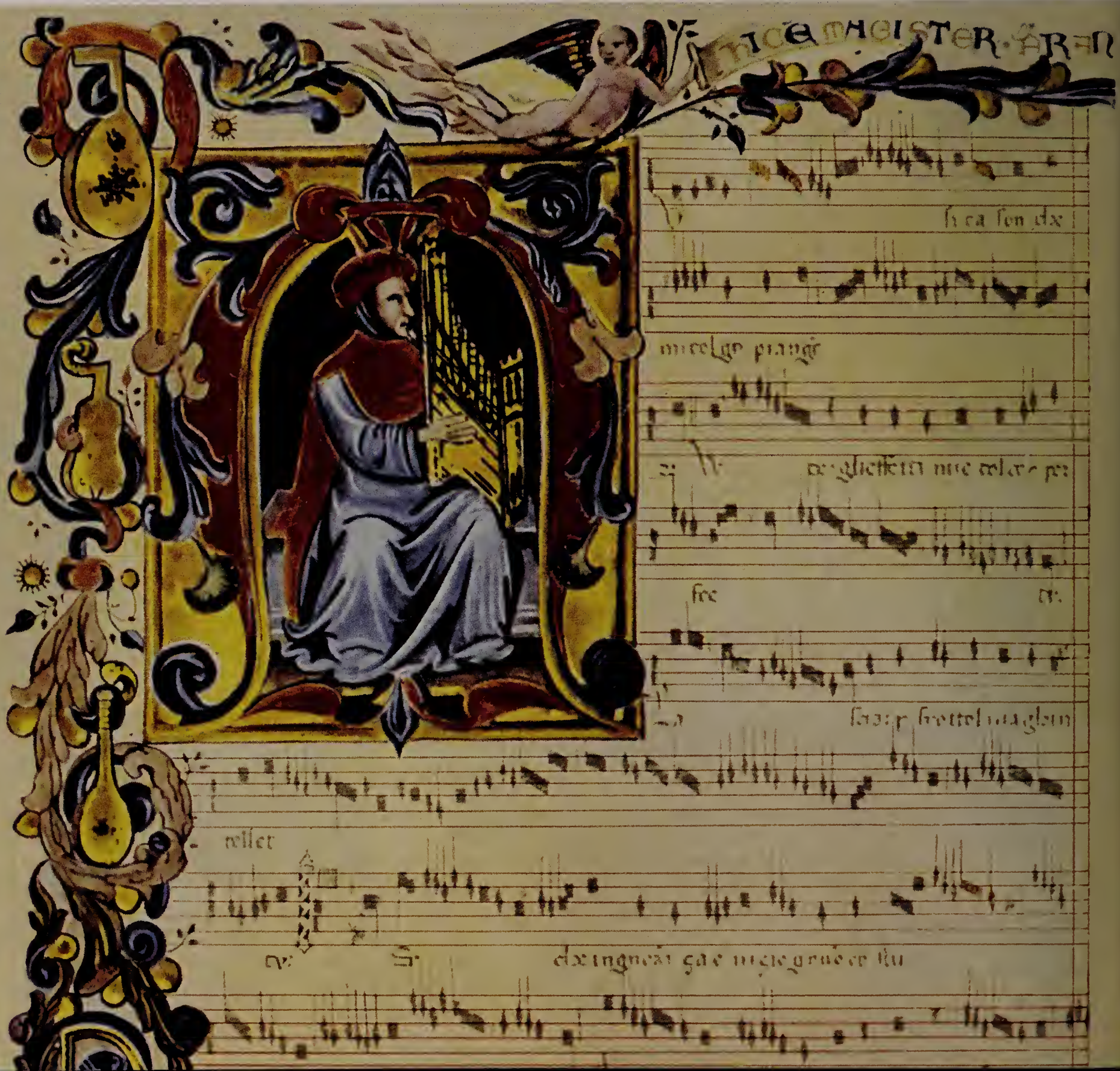

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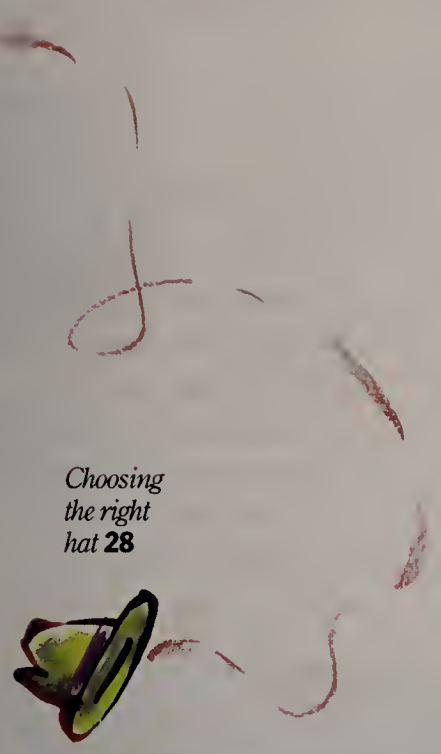

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To compete successfully with outsourcers and systems integrators, internal IS staff must master the art of influence. *By L. Paul Ouellette*

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NOTEBOOK: AI-DENTITY CRISIS

At its recent conference, the umbrella organization for artificial-intelligence mavens cut along the dotted line between the commercial and scientific hemispheres of the AI realm. Over on the business side of the divide, there's plenty to celebrate these days. And yet... *By Lew McCreary*

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WORKING SMART: DRILLING FOR DATA

Keeping one of the world's largest offshore oil platforms up and running requires collecting and analyzing tens of thousands of points of machine data. *By Megan Santosus*

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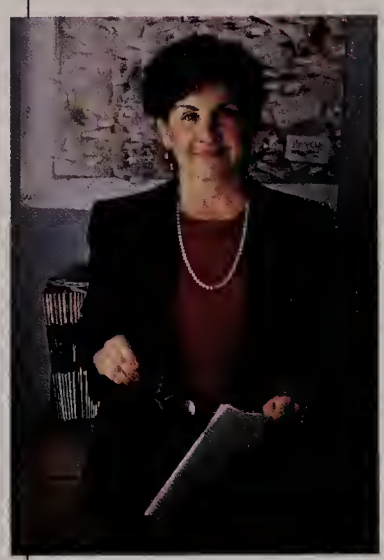

Aside from immersing themselves in what seem like daily technology updates, information executives view themselves as change agents. Many of our readers are seeking ways to bring creativity and new ideas to both their IS departments and their enterprises. Two articles in this issue focus on new approaches for shaking up the status quo.

CIO Senior Writer Thomas Kiely was recently invited to join a group of managers from Guilford of Maine and E.I. du Pont de Nemours for a two-day session devoted to creativity exercises. Kiely documents the event in his article "The Creative Process," beginning on Page 38. Although these managers were not predominantly from the IS sector, the techniques they used to come up with new-product ideas are applicable to all disciplines within an organization. This particular creativity-spurring technique involved defining a problem, allowing everyone's minds to roller-coast through possible solutions and homing in on a few promising courses of action for further investigation.

The process was not perfect—nothing is—but it gave these managers an opportunity to think about business problems in a new light. Although current management thinking encourages such "new age" approaches, it may take a while for most organizations to receive the message. But executives should find du Pont's creativity exercises a valuable introduction.

Another major concern of CIOs is motivating IS personnel to combine their technical expertise with a business perspective. Easier said than done. But Syracuse University has recognized this need and designed a curriculum that fosters both business and technical expertise in students. In her article, "Building Bridges" on Page 70, Writer/Researcher Megan Santosus reports on this innovative educational program.

But back to everyday concerns. The latest installment of our Second Opinions feature ("A Controlling Interest" on Page 48) focuses on the gritty and frustrating problems of CIOs managing the client/server environment. As Senior Writer Richard Pastore discovered from interviews with a panel of IS practitioners and consultants, there simply aren't enough standard products out there to handle the increasingly networked organization.

Readers have responded enthusiastically to the debut of our Second Opinions feature ("Something Old, Something New," May 15, 1993), and we intend to offer it frequently in upcoming issues. Let us know what you think.

Marcia Blumenthal

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"We've tried to manage it by brute force because we haven't found the tools to address these issues for us. We want tools for centrally controlling things like scheduling, security and diagnostics."

—Richard Lester
Vice President of IS
Associated Grocers Inc.

As CIOs scramble to implement client/server computing, they are facing even bigger obstacles than migration logistics or cost-justification: a dearth of "off-the-shelf" tools to get these systems up and running.

First CIOs had to justify the investment in client/server technologies—not an easy task when corporate brass see the large mainframe systems they purchased just 10 years ago facing extinction. Now that CIOs have convinced top management that the benefits of client/server computing outweigh the initial costs, they are stymied by the fact that hardware, software and database manufacturers are not up to speed with their client/server management products.

Vendors, please heed our panel discussion on Page 48. As Richard Lester, vice president of IS at Associated Grocers Inc., discovered, packaged management tools for the client/server environment are desperately needed, as are mutually beneficial partnerships. There is no doubt that the responsibility for achieving success in client/server computing is shared by software/hardware manufacturers and users.

Meanwhile, many companies are finding success through sheer ingenuity and tenacity. For instance, many user companies are writing their own network-management software. They view this as an interim step, while waiting for software vendors to create highly specific packages that will allow a seamless flow of information among employees, customers, distributors and, yes, even competitors.

P.S. Registration is well underway for the next CIO Perspectives Conference, "The Politics of IT: Reordering the Enterprise," to be held October 17-20 at the Westin Mission Hills in Rancho Mirage, Calif. Please call our toll-free registration hot line at 800 366-0246.

PHOTO BY WEBB CHAPPELL

Coming In CIO

In The Grand Scheme

Strategic planning in the '90s means "going beyond alignment to fusion," as one consultant describes it. Corporate goals, business processes, the people who do the work, and the technology, tools and data they need to be effective are interdependent. Waiting for corporate strategy to filter down to the IS department is not good enough. The rules of the game are changing, and the role of the CIO is changing with them.

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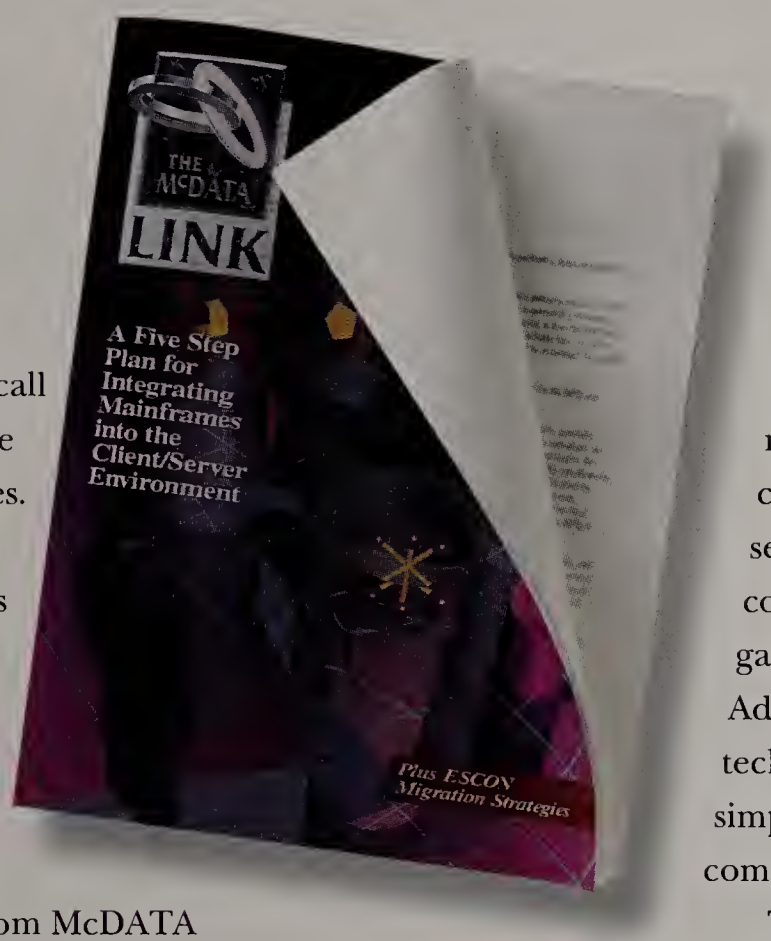
How to survive downsizing.



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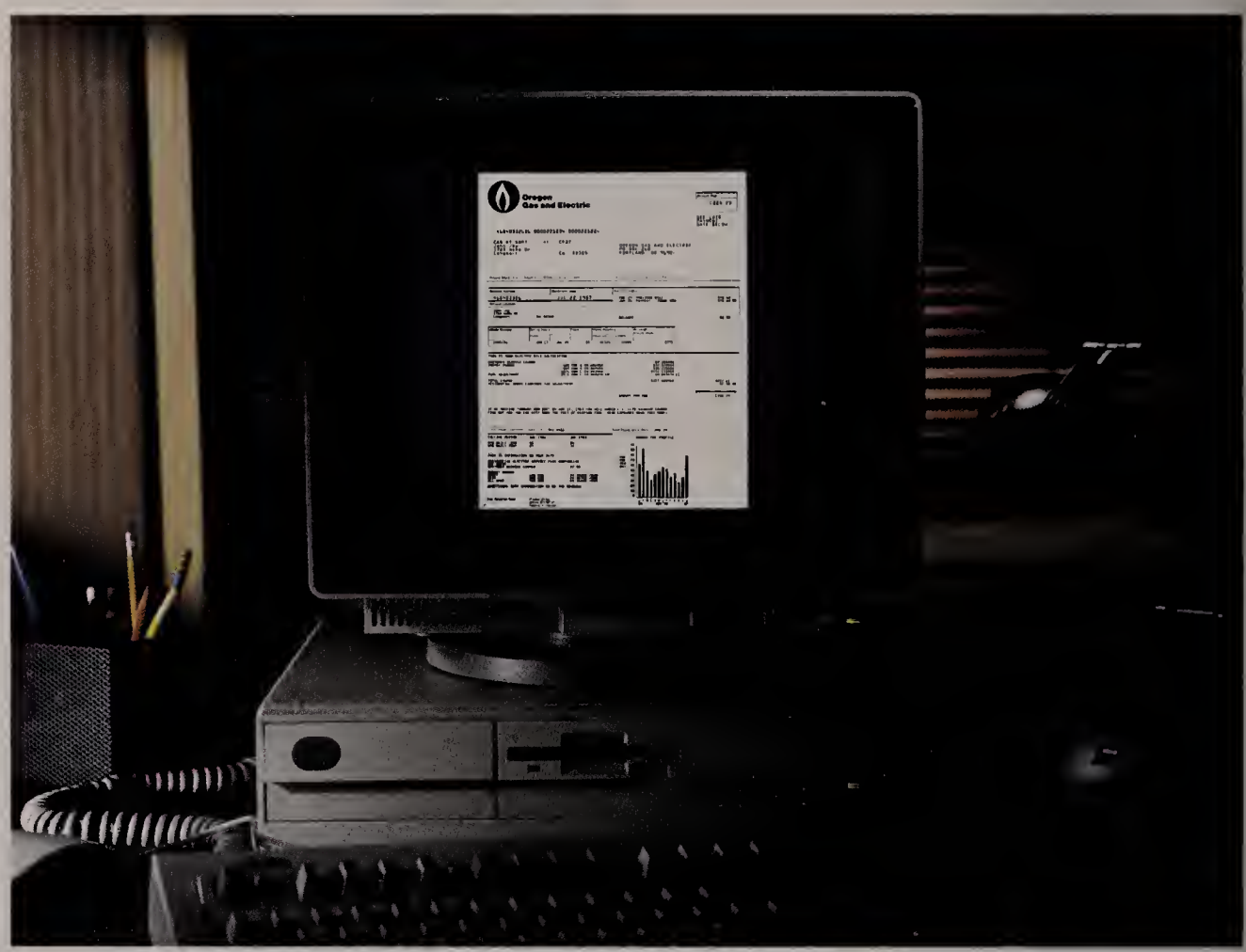

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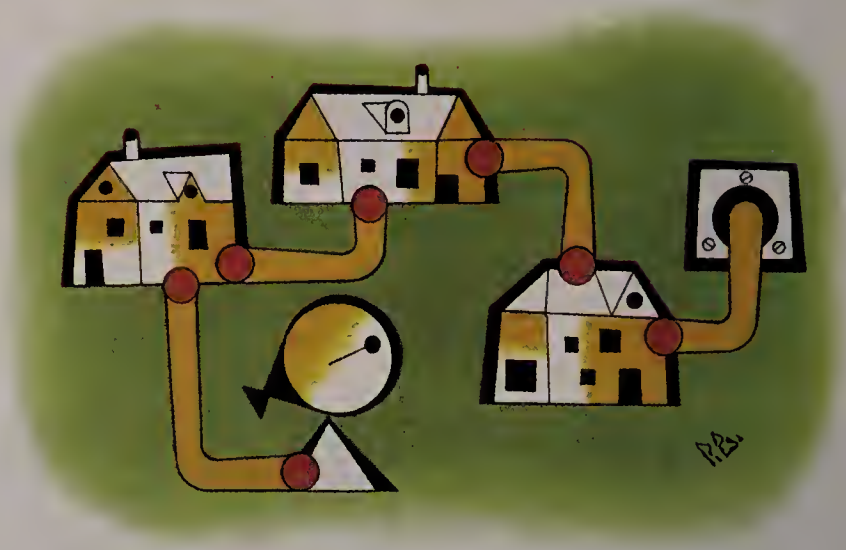
A Burg With the Works

It may be miles from the nearest interstate, but Blacksburg, Va., has just become one of the first access roads to the national information highway. This geographically compact town of 34,000 is the site of a pilot electronic village, designed to enhance the legendary connectedness of small-town life through an advanced telecommunications infrastructure.

The village is a joint project of Virginia Polytechnic Institute, the Town of Blacksburg and C&P Telephone Co., which is contributing $6 million worth of fiber-optic cable, networking equipment and services. The partners want to make a network connection—enabling E-mail, file transfer, virtual-terminal access and switched-video capabilities—available in every home, business and classroom in the community.

In an interview with *Virginia Librarian* magazine, Paul Gherman, special assistant to the vice president for information systems at Virginia Tech, said the project has two goals: "to create a model of what cable information could be in the future [and] to demonstrate what the national information infrastructure will actually look like when deployed at the local level—to show what sociological, economic and political changes will take place in a community when everyone is linked together electronically."



Gherman described some of the applications envisioned for Blacksburg's future: businesses linked to customers; doctors linked to pharmacists and patients; teachers linked to parents and students. "There might be a common medical calendar so that my family physician could check the calendar of a specialist in town and have his receptionist put me on that calendar," said Gherman. "In K-12 education, you might see parent-teacher conferences ... or homework assignments being available for parents to check."

Over the next few years, Blacksburg residents are expected to hold electronic town meetings and conduct transactions with banks, stores and travel agencies from their home computers. The studious will be able to attend lectures, the bored will be able to select from a smorgasbord of video programming, and the hungry can call up a restaurant menu and order the antipasto without ever leaving their armchairs.

Project leaders are also touting the village's potential as a laboratory where companies interested in advanced information services can test new products and delivery mechanisms. Basically, the village provides the test subjects and the front-end, integrator software; other organizations contribute individual applications, such as electronic checking and library searches. Once a critical mass of users is achieved, the most useful, cost-effective applications can be replicated in other communities.

C&P President Hugh Stallard said the project needed additional partners to invest

ILLUSTRATION BY PHILIP ANDERSON

New Inklings

A new publication aims to help businesses map their strategies—literally. A recent issue of *Business Geographics*, "the geographic technology magazine for the business community," offers a cover story on Continental Airlines' interactive cabin video information system as well as features on geographic information systems' use in real estate, banking and other industries. *Business Geographics* is free to qualified individuals; a one-year (six-issue) subscription costs $92. For information, call 303 223-4848.

Protection and awareness bulletins have been added to *Computing & Communications: Law & Protection Report*, a monthly publication covering laws and litigation risks related to the protection of data, information and computer-systems operations. Each bulletin discusses a compliance issue in terms of what the law or regulation proscribes, the consequences of violation, conduct to be avoided, and practices and behavior considered legal and ethical. A year's subscription is $84. For more information, call 608 271-6768.

Computer companies today are facing more and more challenges than ever before. Challenges such as the call for superior customer service. Not to mention handling more calls. Which means busier customer service representatives. As well as more busy signals. Bigger problems, smaller profit margins. How can your company provide high-quality customer service at an affordable cost? Companies like Borland, Micro-Sota, DacEasy and Philips Consumer Electronics are doing it with AT&T *MultiQuest* 900 Service.

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in new applications and technologies, and a regulatory environment where such experiments could thrive. If the next steps are successful, Stallard said, Blacksburg may become "a community whose residents, businesspeople and students are interconnected by a network that is the envy of the world."

We Said They Were Good with Technology...

The cream has curdled at Stew Leonard's Dairy Store, the celebrated Norwalk, Conn., grocery giant. The same computer expertise that helped earn the company a 1993 CIO-100 award for excellent customer service was instrumental in a nefarious decade-long tax-fraud scheme perpetrated by CEO Stew Leonard, CIO Stephen Guthman and two other top executives, according to press reports. The four were charged with skimming $17.5 million in store receipts and covering up the act with a computer program that corrected for the cash discrepancies.

The same program, seized by federal investigators from its hiding place in a hollowed-out book, helped nail the executives, who pleaded guilty in late July to conspiracy charges. Leonard agreed to pay $15 million in taxes and fines. The conspirators are subject to penalties of five years in prison and $10,000 fines.

Besides the honors from *CIO* (the company also made our 1990 CIO-100 list recognizing innovation), Stew Leonard's was lauded by quality guru Tom Peters and cited for entrepreneurship by President Reagan. The company also made it to the finals of the Malcolm Baldrige National Quality Awards competition and conducted business-excellence seminars for the likes of IBM Corp., Marriott Corp. and Wal-Mart Stores Inc.

Leonard and his family expanded the small grocery to a two-store enterprise complete with mechanical singing cows, petting zoos and record-setting sales-per-square-foot of retail space.

Press 1 for Plaid, 2 for Paisley

The airport is a terrible place for shopping addicts. Laid over for hours, seized with the unconquerable urge to acquire, they have little more to choose from than plastic combs, magazines and ashtrays imprinted with the state seal.

Fortunately, a company in Des Moines, Iowa, is offering relief. MicroMall Inc.'s electronic retail kiosks take the idea of catalog shopping one step further, enabling users to browse and buy in office buildings, hotels and transportation sites. With 28 retail kiosks rolled out so far in Chicago, and two in Wilmington, Del., MicroMall is aiming at a new retail market: consumers at work and traveling.

With the help of Bell Atlantic Directory Services, the CD-interactive technology enables customers to view pictures of available merchandise on the kiosk's screen while listening to descriptions of the products. Customers use a touch screen to move among and select items. They pay with a credit card, and the system prints a receipt.

So far, participating catalog retailers include JC Penney, Hammacher Schlemmer, Lands' End, Wine Enthusiasts Companies, Spiegel and Pfalzer Brothers.

MicroMall says it is positioning the kiosks as the first step in bringing retail services into the home over an advanced, interactive communications network. Move over Home Shopping Channel.

PROBATION KIOSKS

Automated Offender Check-In

As part of a massive effort to streamline its adult-supervision operations, the New York City Department of Probation will pilot video-based kiosks on the streets of Manhattan. The kiosks, which will serve as automated reporting facilities for the city's non-violent probationers, were designed to free up case workers and resources for more-dangerous offenders.

The kiosks are part of a comprehensive reengineering effort that the department is planning with the help of NYNEX. The effort also includes using new ways to identify the most-vi-

CAREER MOVES

Bell Atlantic Corp. of Philadelphia has appointed RALPH J. SZYGENDA vice president and CIO. Szygenda was formerly vice president of information systems and services and CIO at Texas Instruments Corp., in Dallas.

At Bell Atlantic, Szygenda will work to finalize plans for the implementation of Systems 2000, the company's strategic initiative to upgrade and integrate its operations-support systems.

ILLUSTRATION BY SUSAN GROSS

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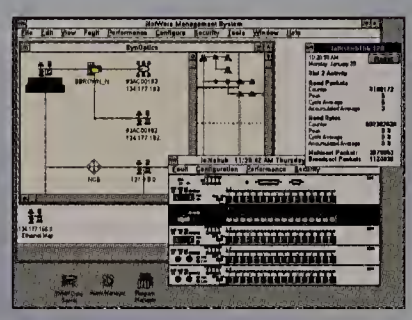
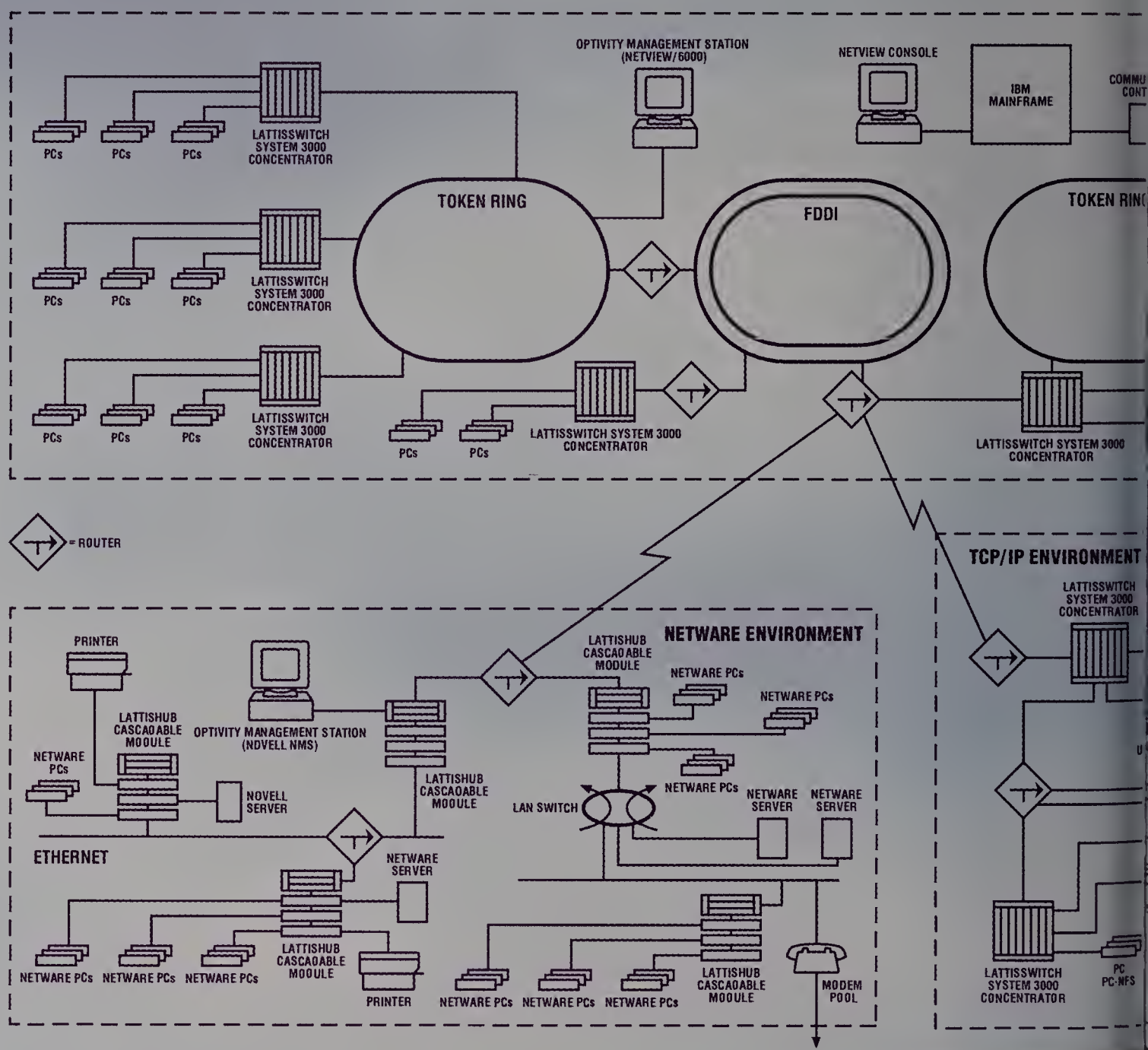


SynOptics' Optivity™ network management system is integrated with all the leading open management platforms.

With SynOptics, your whole approach to network management is cleaner. Our Optivity™ and LattisWare™ software solutions support all major network technologies, as well as emerging ones like ATM. Be it SNA,™ NetWare,® TCP/IP, or a mix of all three, our customized solutions handle it all. For example, we've integrated Optivity and LattisWare with all the leading



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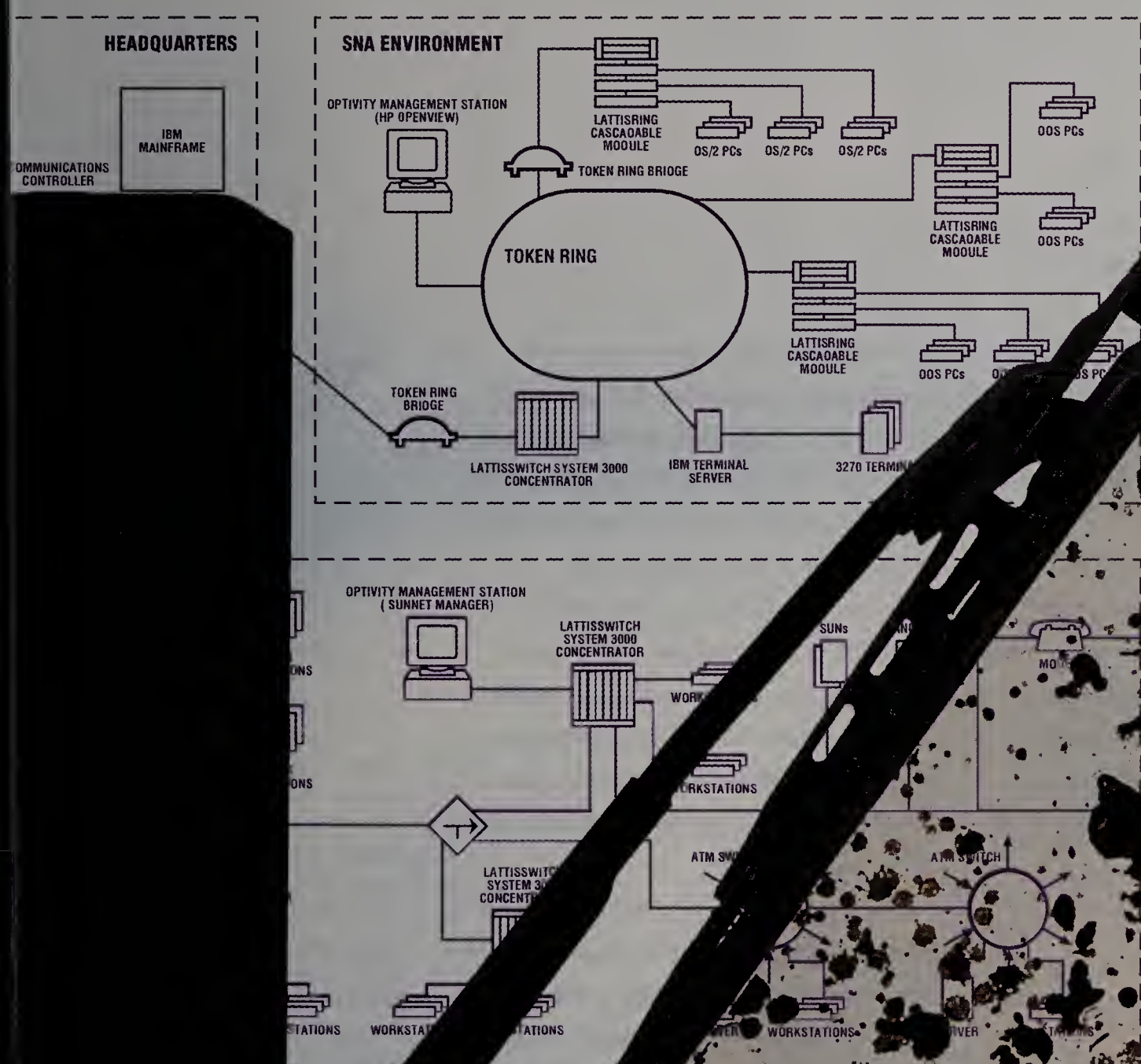
The Network Fabric of Computing



olent probationers, providing intensive counseling services, redesigning an IT-based probationer-tracking system and reducing administrative paperwork.

"We have roughly 60,000 cases at any one time," said Michael P. Jacobson, commissioner of the department. "The kiosks will allow us to maintain some very basic functions that we do now, while we move resources from the low-risk population to the high risk."

The kiosks will be used initially to keep tabs on people whose terms of probation require them to remain in the city. Currently, the department tracks these probationers by asking them to periodically fill out questionnaires with information such as their current address and work status. But the department has no way of ensuring that the person dropping off the form is in fact the probationer and not some helpful friend or relative.

The kiosk system will address this problem with some type of ID-verification technology, such as voice recognition, bar codes or fingerprint readers, and will be integrated with a newly implemented automated management system. "This way," Jacobson explained, "we can replace the questionnaire process and improve our ability to keep track of probationers at the same time."

According to Jacobson, approximately 40 percent of adults currently on probation are classified as low-risk offenders. Of these, he estimates that one-third will probably be able to use the kiosks exclusively, eliminating face-to-face meetings with case workers.

If the pilot proves successful in Manhattan, the kiosks will be rolled out one borough at a time, and new capabilities may be added. "The kiosks can be useful in giving out information about job programs, training or recreation," Jacobson said. "Given what we do now, this would be quite a step up."

Valley of the Gigabytes

Computers have been used to reconstruct the original manuscript of James Joyce's *Ulysses* and to ferret out plagiarism in a biography of Abraham Lincoln. But now a computer has achieved something so momentous that it eclipses all other applications of technology in the service of literature.

It has written a Jacqueline Susann novel.

The machine in question is a Macintosh II CX running an artificial-intelligence program created by freelance writer and computer consultant Scott French. An admitted fan of the author of *Valley of the Dolls* and other pulp pearls, French purchased an expert-system shell program and wrote rules that described style elements such as sentence construction and viewpoint, scene types such as flashbacks and exposition, and actions such as double crosses and assignations. He then input two Susann novels and ran them through his qualifiers, in the process creating rules dealing with every nuance of the Susann oeuvre.

The result is *Just This Once* (Birch Lane Press, $18.95), a "fast-paced story of two women and two men who are forced to deal with the questions of their very souls when fame, fortune and temptation come to call," according to the dust jacket (presumably written by a human being).

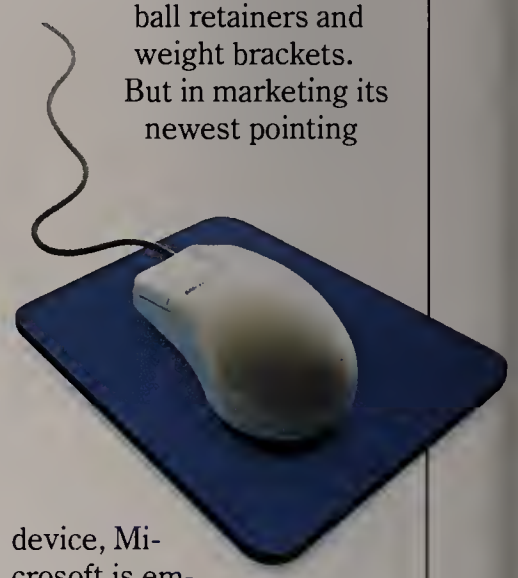
The novel begins thus: "Silent vibrations of power emanated from the four men who occupied the plush velvet chairs surrounding the antique cherry-wood table supposed to have once been owned by Napoleon." And so on.

A word of warning: *Just This Once* shares its models' predilection for sex and drugs. French's program belongs in a plain brown wrapper.

Under My Thumb

Forget all that no-pain, no-gain stuff. Microsoft Corp. is selling its version 2.0 mouse the way Posturepedic sells mattresses—with an emphasis on comfort and anatomically conscious design.

Sure, there's the usual spiel about cursor accuracy, ball retainers and weight brackets. But in marketing its newest pointing device, Microsoft is emphasizing the two years of ergonomics testing that went into the redesign. Employing a VPL Data Glove to measure even minute changes in position, Microsoft was able to map the shape of the human hand, both at rest and during use. Then it basically designed a mouse to fill the space beneath the hand.



As a result, Mouse 2.0 is larger and longer than its predecessor, in order to provide full hand-plane support. Its low, rounded back was designed to eliminate edges and to allow the hand to rotate slightly toward the little finger. The narrow width and side height facilitate a more comfortable "pinch grip" be-

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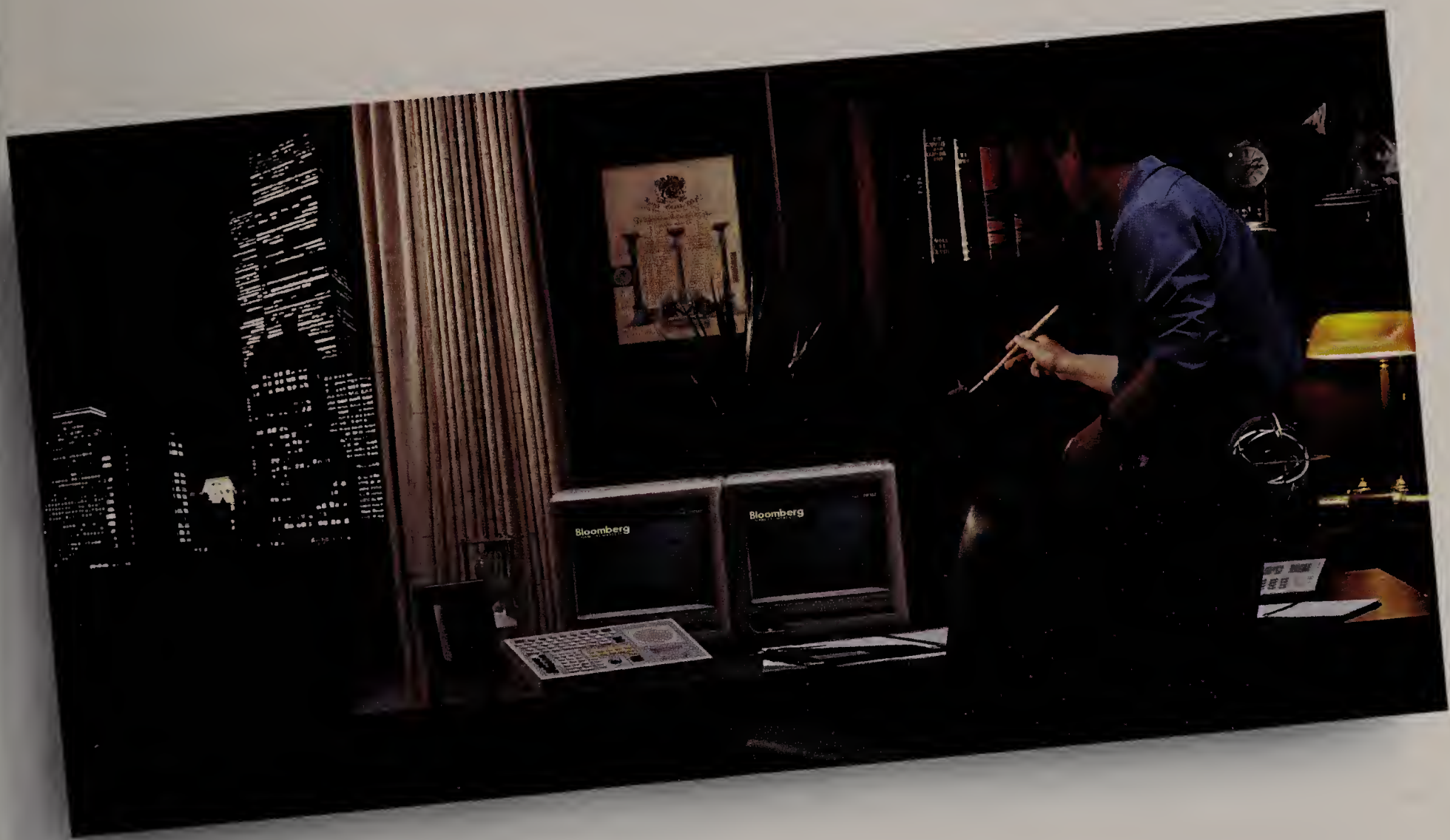

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TRENDLINES

tween the thumb and third finger, and a visual cue on the device encourages a comfortable right-thumb position for the most common mouse grip.

"The ergonomic shape makes using the mouse more comfortable than ever," said David Frager, manager of peripheral products at Dell Computer Corp. Dell has chosen version 2.0 as the standard input device for its desktop systems—hands down. Call 206 882-8080 for more information.

Savings Where You Find Them

Ever wonder why process redesign is such a popular boardroom topic? Citicorp Chairman John Reed supplied a macroeconomic answer in a speech at the Enterprise '93 conference in Boston: lack of economic growth. In the current lackluster economy, he said, companies aren't growing their way to bigger profits. They must eke out profits by wringing more productivity from their organizations.

"We believe 50 percent of our costs are displaceable by IT," said Reed. He sketched out some moves he has in mind, including consolidating data centers and bringing data processing home to the United States. Reed noted that it is now cheaper to do data processing stateside than to operate centers in such places as Japan and Singapore, and that skilled labor is available.

To reduce credit-card fraud, Reed suggested creating behavioral models that can spot aberrant transactions and placing digitized images of cardholders' faces on their cards.

EVENTS

Unix Expo: The Open Systems Show
Jacob K. Javits Convention Center, NewYork.
Sept. 21-23
National Bleinheim Expositions Inc.
800 829-3976

This seminar uses tutorials to educate attendees in organizational requirements, technical aspects and critical issues of open-systems technologies. Taught by technical experts, the classes will cover such topics as the basics of Unix system administration and selling Unix to upper management. Registration fee: $360

Electronic Books 1993
Sheraton New York, N.Y.
Sept. 28 & 29
Meckler Conference Management
800 632-5537

This is the first annual conference and exhibition dealing with the emergence of electronic books. It will focus on traditional forms of information, their transformation by interactive media, and the rise of palmtop and portable electronic media. Registration fee: $350

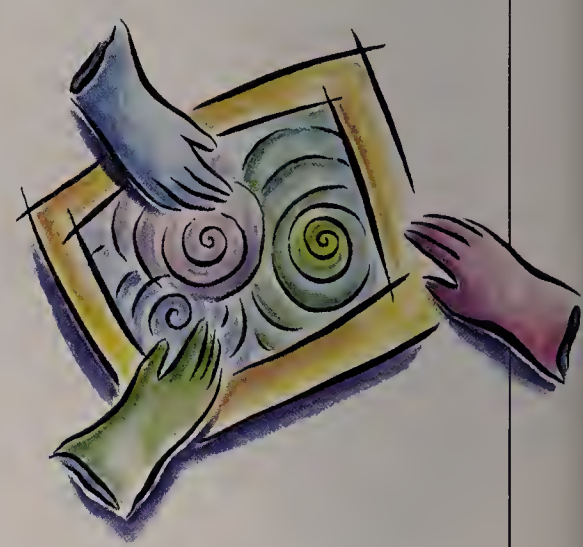
CHIME Fall CIO Forum
Colony Beach & Tennis Resort, Longboat Key, Fla.
Oct. 7-9
College of Healthcare Information Management Executives
313 665-0000

Information executives need leadership skills to survive and excel in the era of health-care reform. Physicians and University of Michigan faculty will present and facilitate lectures, case work, discussions and group exercises. Registration fee: $125 for members

Energizing Performance with Communications
The Century Plaza Hotel, Los Angeles
Sept. 30 & Oct. 1
The Grand Hyatt, New York
Oct. 19 & 20
The Conference Board
212 339-0290

The latest trends and issues in proactive employee communications, corporate makeovers, strategic communications planning, marketing communications, media relations, supplier-partnering and extending international contacts. Registration fee: $1,065

On the Record



A recent article in *Communication Arts* lauded the utility and simplicity of touch-screen interactive systems. But although the technology is user-friendly in theory, not all users are friendly in practice. What follows is a sampling of the stupid touch-screen-user tricks that reporter Sam McMillan and his sources have observed:

- **A doctor at a medical convention used his entire hand—palm outstretched, fingers and thumb—to press the screen. At the same convention, another physician continued to press the screen so hard in the wrong place that he pushed the monitor through the back of the kiosk.**
- **Users turn off the monitor when they walk away, shutting down the entire system.**
- **Users press the screen and won't let go.**
- **Users press a button and then drag their fingers across the screen.**
- **Users press two buttons at once.**
- **Users approach the kiosk with a Swiss Army knife at the ready. "Kiosks in public places live a mean, brutal life," McMillan reminds his readers. "You will learn the hard way that they must be armored."**

ILLUSTRATION BY SUSAN GROSS

Imagine upgrading every printer on your network with just one of these.

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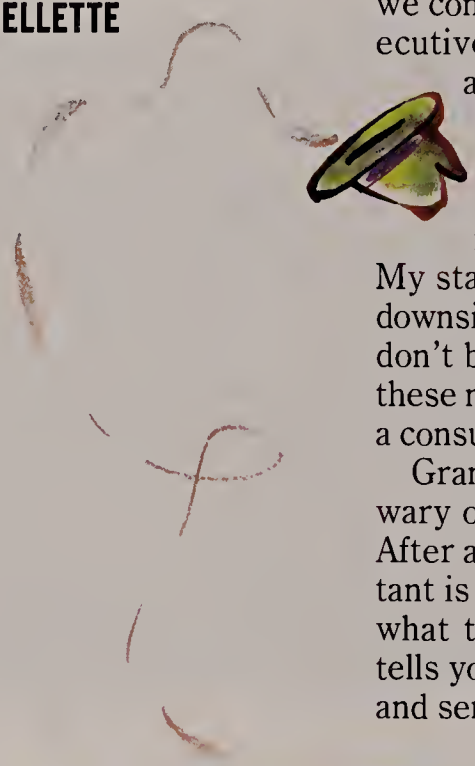
A Consultative Approach

To compete successfully with outsourcers and systems integrators, internal IS staff must master the art of influence

BY L. PAUL OUELLETTE



Now more than ever, corporate IS departments are competing with external vendors for the privilege of being selected as their company's IS supplier of choice. CIOs and their staffs must operate as internal consultants or risk becoming casualties of the outsourcing wars.

Many CIOs know this. At Ouellette & Associates Consulting Inc., we constantly hear frustrated IS executives saying, "The outsourcers and systems integrators are taking away our business. Our clients are becoming more technically savvy and are innovating more on their own. My staff has been restructured and downsized to near-oblivion, and they don't believe we can compete with these negative forces. Help me build a consultative IS organization!"

Granted, IS professionals may be wary of becoming like consultants. After all, as the joke goes, a consultant is someone who, when you ask what time it is, takes your watch, tells you the time, keeps your watch and sends you a bill. But despite the poor reputation consultants have earned, the act of consulting is something IS professionals do every day, although they may not realize it. Whenever you're asked to solve a problem, offer an opinion or provide advice, you're acting as an internal consultant to an internal client, someone within your corporation who needs your expertise.

We define consulting as influencing without direct power. In today's reengineered companies, the only power left is the power of influence. Master that, and you virtually guarantee success. Help your staff members master it, and you'll soon be coaching a top-flight IS organization that commands the respect of the company—and that beats out the external consultants every time.

A wise man once said, "I present myself to you in a form suitable to the relationship I wish to achieve with you." We've identified four consulting roles that will be familiar to most IS professionals because they use them every day, although perhaps not deliberately. These roles are technical wizard, technical assistant, silent influencer and problem-solving partner. By consciously assuming the four roles as situations warrant, IS professionals can improve their interaction with internal clients throughout the corporation. Don't think of learning and practicing these roles as deceptive or disingenuous. On the contrary, the ability to master and assume them judiciously will build and strengthen ties to clients.

The roles presented here require increasingly sophisticated skills, beginning with purely technical abilities and building to a combination of technical knowledge, interpersonal aplomb and business acumen.

Technical Wizard: IS professionals are probably most accustomed to

ILLUSTRATION BY BETHANY GULLY

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assuming the consulting role of the technical wizard. In this scenario, the internal client presents a technical problem, defers to the wizard's expertise and waits for an answer. The technical wizard solves the problem and disappears. But sometimes the internal client doesn't need a guru. That's when the other three roles come in handy.

Technical Assistant: Occasionally, the right consultative approach involves allowing internal clients to "hire" IS staff from the neck down. They don't need IS's advice; they may already have established a destination and just need help getting there. That's OK. The astute IS professional knows when to leave wizardry at home and arrive at the client site ready to assist.

Adopting the role of the technical assistant is an effective way to gain insight into the client environment. But beware of assuming this role too frequently. You could end up being pegged as *only* an assistant and not get proper recognition or opportunities to practice other roles.

Silent Influencer: This is the consultative role that most IS staff assume, sometimes unintentionally. During the course of a normal business day, most employees are asked their opinions and give their best-shot answers. Some realize the potential this role has for allowing them to shape events or advance their own agendas.

We refer to this consulting mode as the silent influencer because it is performed in the background. The IS professional acts as a sounding board for the internal client. Silent influencers do not receive credit for ideas that succeed, but they may be blamed when their ideas fail. A silent influencer accepts that responsibility and offers input accordingly.

Problem-Solving Partner: The most sophisticated consulting role is the problem-solving partner. The internal consultant and client develop a relationship based on mutual trust, respect and a willingness to listen and take risks. They work to generate lasting solutions rather than seek quick fixes. They agree upon their project's mission and cooperate to reach their goal. The internal consultant concentrates on building the client's commitment, confidence and competence.

A wise man once said, "I present myself to you in a form suitable to the relationship I wish to achieve with you."

All this presents something of a quandary for IS staff. IS professionals sometimes assume that the roles of technical wizard and problem-solving partner are the most vital for adopting a successful consultative approach. Although they are often the most visible—and therefore desirable—roles, they are not sufficient unto themselves.

A sea captain and his engineer got into an argument about who's job was more important to the ship. To settle the conflict once and for all, they decided to trade places for a day. The chief went up to the bridge and the captain went down to the engine room. After a few hours, the captain suddenly appeared on deck, covered with oil and soot."Chief," he yelled, wildly waving a monkey wrench. "You'll have to come down here! I can't make her go!"

"Of course not!" replied the chief. "We're aground!"

Just as the captain and chief discovered that their jobs were of equal importance, so CIOs and their IS staffs must value each of the four consulting roles. However, while the ship would run smoothly as long as the sea captain and the engineer stuck to their own jobs, the roles within IS are not so logically apportioned. To develop a truly effective consulting organization, IS executives should ensure that all staff members are able to fill all four consulting roles.

CIOs and their direct reports may have mastered the four roles to the degree where they perform them unconsciously. That is not enough. For the consultative approach to make a broad impact on the entire corporation, every member of the IS team must be able to adopt these roles in his or her daily interaction with clients.

One CIO whose organization we trained in the consultative approach two years ago continues to challenge his staff members, asking them what role they plan to use whenever they are about to meet new clients or begin work on new projects. They discuss the advantages and disadvantages of the four roles and determine the best role for each situation.

This CIO has embedded a consultative philosophy in every one of his staff members, and he continually reinforces it by working with them to hone their consulting skills. In his corporation, internal IS is the supplier of choice because it gives its clients what they need and delivers services with an attitude of cooperation and support.

Although it may seem excessive to quiz staff members before every client engagement, that's exactly what your external competitors are doing. Consultants always rehearse how they'll behave with various clients in different situations. You can't afford to do less.

When in doubt about which of the four consulting roles is the best in a given situation, we recommend beginning with the problem-solving partner approach. Offer to build a relationship at the outset of your interaction with your internal clients. If you sense the client doesn't want or need that much involvement, simply reposition yourself toward technical wizard, technical assistant or silent influencer, and back again, based on your client's direction.

Adopting a consultative approach requires a combination of expertise and sensitivity. With some training and practice, IS professionals can get the knack of using all four consulting roles to beat the outsourcing consultants at their own game. CIO

L. Paul Ouellette is CEO of Ouellette & Associates Consulting Inc., in Bedford, N.H. He originated and co-wrote Consulting Skills for Information Professionals *and is the author of* How to Market the IS Department Internally *and* IS At Your Service.

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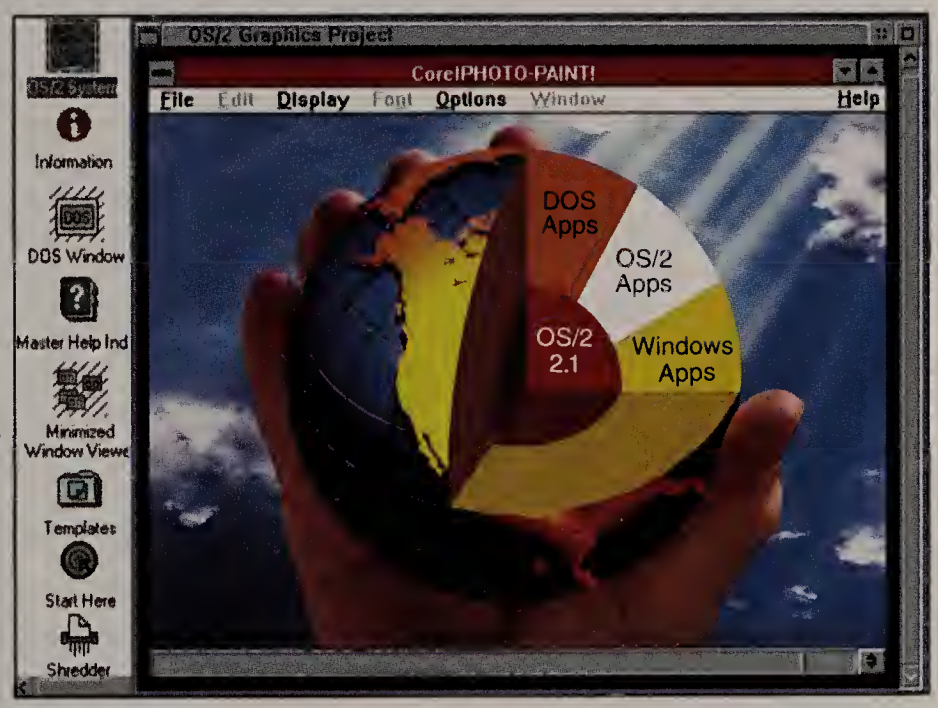

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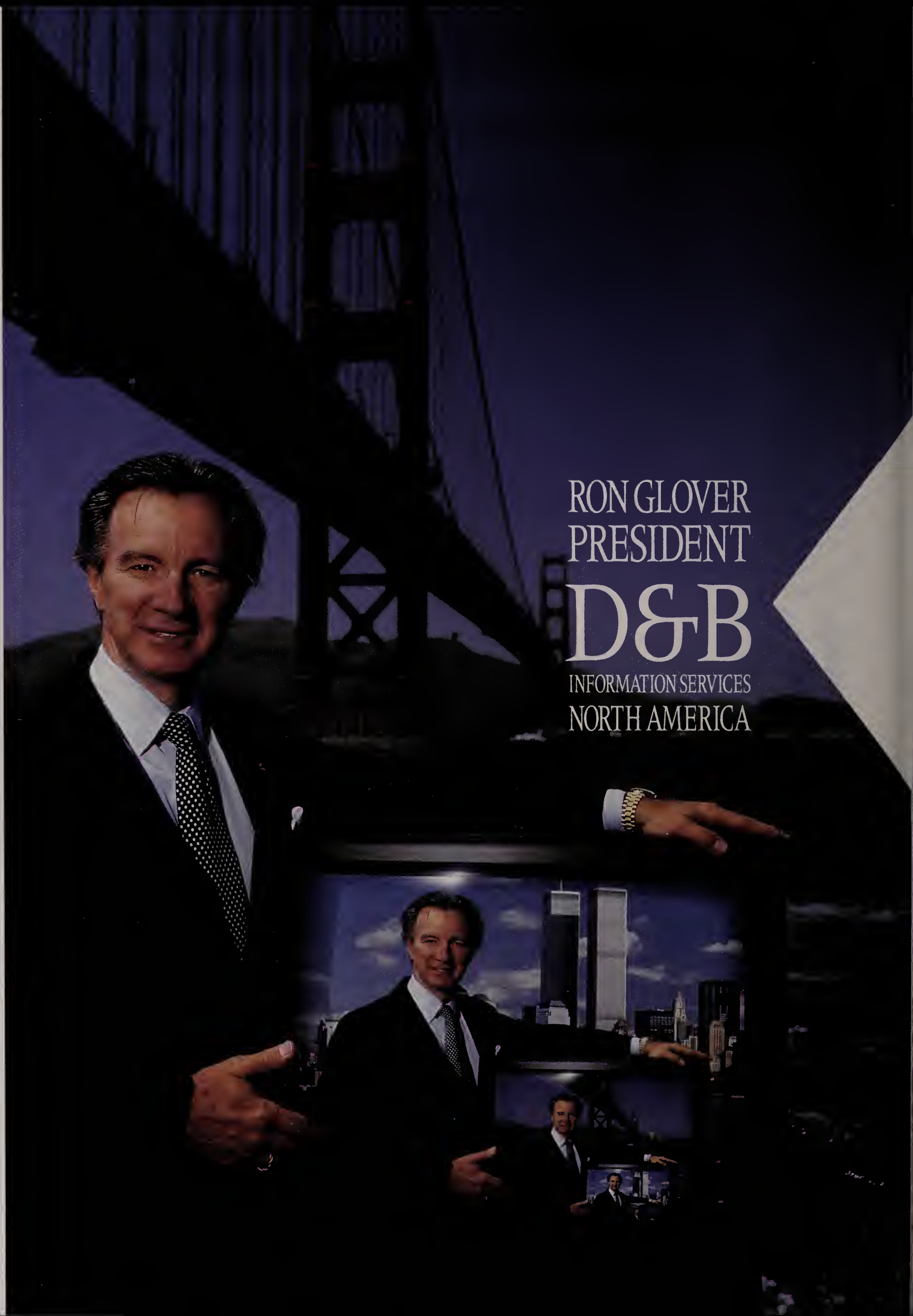
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AI-dentity Crisis

At its recent conference, the umbrella organization for artificial-intelligence mavens cut along the dotted line between the commercial and scientific hemispheres of the AI realm. Over on the business side of the divide, there's plenty to celebrate these days. And yet...

BY LEW McCREARY

The American Association for Artificial Intelligence (AAAI) underwent a form of cell division at its show and conference held in mid-July in steamy Washington. Offered for the first time was Intelligent Systems at Work Today (ISAWT), a separate three-day program devoted to business applications embodying some of the various technologies that share the AI name (itself the subject of considerable second-guessing). But the severing of applied commercial AI from its scientific/theoretical counterparts reflected a split that's been aborning for quite some time.

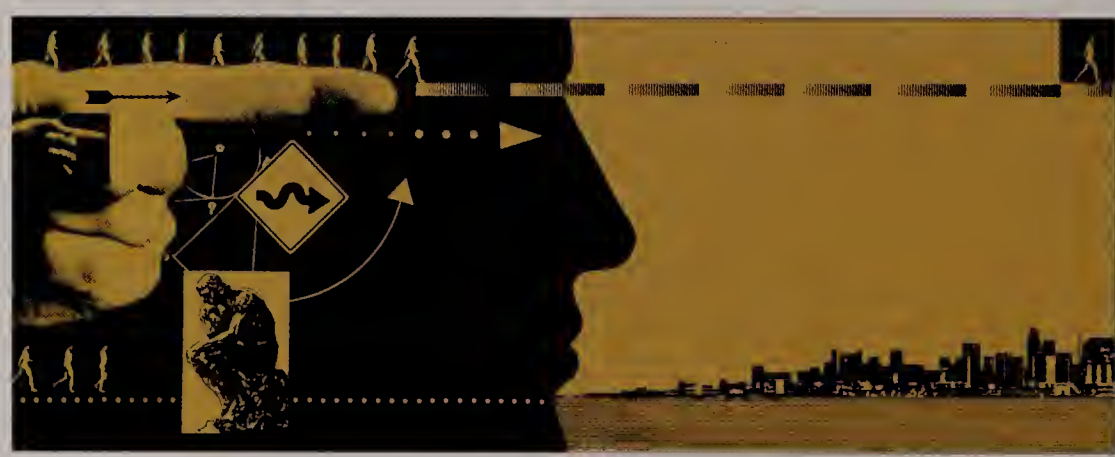
The extremist, pure-science types tend to scorn the make-a-buck practicality of the commercial faction, while the commercializers ridicule what one presenter joked was the AI scientists' tendency to investigate such pointless esoterica as "how much of a bird is Tweety?"

But there's room for both birds and bucks under the big—though now bifurcated—tent of the AI community. The big news for business these days is that AI is being cleverly, and profitably, woven into many innovative systems and applications, some generating beguiling tales of whopping ROI.

Take the case of Ford Motor Co.'s U.K.-based division. In 1988 it began developing a computer-aided parts-estimation (CAPE) system for use in generating, evaluating and costing plans for manufactured parts. The system is now in use by Ford in the United Kingdom and in some of Ford's German operations. It employs heuristic search techniques to model the risks and opportunities inherent in various parts-design alternatives, presenting the positive and negative cost implications of each choice. According to Adam Cunningham, one of CAPE's developers, the system has cut in half the time required to cost out a part, at the same time improving cost control. CAPE can also capture, and store for future reference, important feedback from Ford's suppliers about the quality and manufacturability of its designs.

Once fully implemented, CAPE is projected to have cost something like $20 million and to have consumed 100 person-years of development effort. If that seems like a hefty investment, ponder Cunningham's assertion that the system recently saved Ford $7 million on the design of one part alone. "When you consider that there are over 6,000 parts in a car, you get an idea of the system's potential," said Cunningham. CAPE has not yet been implemented in Ford's U.S. divisions, although pilot projects are underway.

Purchasers of Compaq Computer Corp.'s networked printers get an AI-based customer-service bonus called QuickSource: three floppy disks that help them perform routine printer maintenance as well as troubleshoot and solve nettlesome printing problems. Besides providing vital differentiation in a hotly competitive market, this virtual on-board help desk (which includes full-motion video and sound) saves Compaq an estimated $10 million to $20 million a year in customer-service expenses, speeds the training of



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support personnel and gives customers the ability to limit downtime by putting problem-solving expertise in their hands. The beauty part is that the system was created for, oh, about $50,000, according to developer Trung Nguyen.

Many of the 16 cases presented during ISAWT featured not only speedy paybacks but an assortment of other impressive benefits: extending the useful lives of legacy systems (AT&T); improving customer satisfaction (Compaq and others); remediating data-quality problems (the Tennessee Department of Correction, Nynex, Boeing and others); eliminating legal-liability exposure (Tennessee); and bringing greater speed and order to resource allocation and scheduling (AT&T, Nynex and others).

Despite the promising successes embodied in the 16 case stories, many of the other presentations and panels included, either blatantly or as marginalia, the sort of hand-wringing, scolding and soul-searching that are the familiar baggage of a community earnestly in search of its rightful place in the universe. It's truly a strange phenomenon, in a society that plainly worships at the altar of technology, to observe that technologists themselves feel so benighted and misunderstood. But that seems to be the case in the AI community (just as it is within MIS). One speaker referred, perhaps ironically, to the current season of "AI winter." And a panel on the coming generation of knowledge-based systems set its scene by declaring a condition of low success and slow growth among currently deployed applications; from there the panelists went on to enumerate a half-dozen problems that must be solved before the future can dare to announce itself.

But who needs to wait for the future? Apparently, the applications honored at ISAWT hardly make a dent in the low-hanging fruit of AI's immediate commercial potential. There's much more to be done and too little effort being focused on doing it—a fact for which developers were duly spanked a number of times by presenters.

Joe Carter, a partner in Andersen Consulting's AI practice in Chicago, faulted both AI's commercial and scientific wings, as well as the trade and popular press, for their "gross misuse and abuse of the human metaphor" as a model for computer systems. Carter said this preoccupation with replicating human thought processes has distracted developers from recognizing other valid metaphors for intelligence that could spark profitable opportunities that are currently ignored. Declaring that the model of the human expert is "overrated," Carter said it's frequently better for AI to make the sorts of decisions that humans *don't* make than to emulate decisions that humans *do* make.

The big news for business these days is that AI is being cleverly, and profitably, woven into many innovative systems and applications, some generating beguiling tales of whopping ROI.

Ed Feigenbaum, one of AI's seminal pioneers, said developers of AI tools had erred in providing empty logical shells rather than "knowledge-full systems." To illustrate the virtues of knowledge-fullness, he gave the example of Sekisui Heim, a Japanese modular-home company whose vast and flexible knowledge base allows it to custom-design homes right down to the last nail, with an error rate of zero. As barriers to AI's manifest destiny, Feigenbaum cited the failure so far to agree upon standards or to make the knowledge-representation and -acquisition tasks easier.

Interestingly, Carter is known for presiding over one of the largest and most successful AI implementation practices, and Feigenbaum has championed AI for decades. Both have earned their stripes as enthusiasts—and realists. It's not that AI has failed, only that its success has come too slowly to live up to the hoopla and, ironically perhaps, too stealthily, now that the technology is included so matter-of-factly in applications that it can almost go unnoticed.

The Andersen consultant who presented the story of the Tennessee Offender Management Information System (TOMIS), a comprehensive correctional-management system now in use in Tennessee's courts and prisons, seemed apologetic that the system used "only a little bit" of AI. It turns out that the "little bit" is confined to the module the system uses to do its most difficult task, that of calculating and updating prisoners' sentences. A thick stew of legislative changes, mandated prison-population caps and time-off credits that prisoners earn throughout their terms makes sentence calculation an arcane and deeply complex art. In even the most expert human hands, it's so error-prone that, before TOMIS came online, Tennessee was vulnerable to lawsuits by inmates who had been kept behind bars beyond their rightful release dates. So, that smidgen of AI brings sentence-calculation accuracy up from 80 percent to 100 percent and, most importantly, yanks Tennessee's correction department out of harm's way by solving a long-term liability problem.

As Feigenbaum observed, "When people ask, 'Where's the AI?' we should ask a simple question in return: 'Could you [have built the system] without AI?' " In the case of Tennessee and the others, the answer is no. Or, as another attendee remarked in answering much the same question, "Do you think a CEO gives a rat's ass if there's AI in it or not? All he cares is that the damn thing works."

Notwithstanding the hard-dying benightedness of AI's practitioners (many of whom will never forget the conference-room breezes stirred by minds snapping shut whenever the words "artificial intelligence" and "application" were used in the same sentence), the damn things are definitely working. CIO

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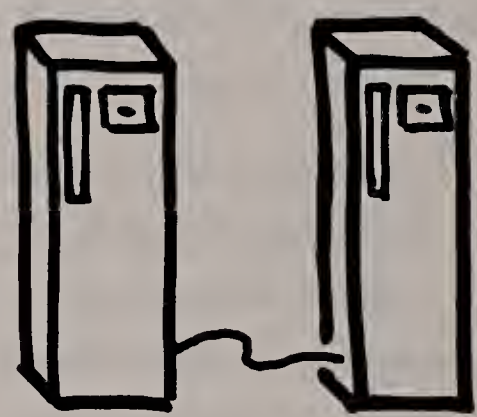

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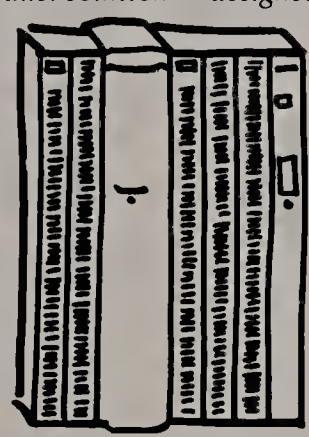

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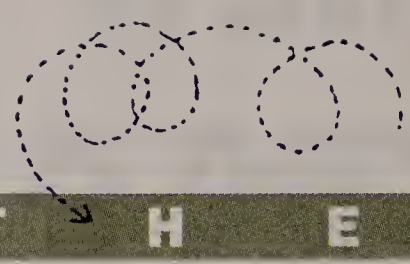

THE CREATIVE PROCESS

STORYLINE

At du Pont, not all of the chemistry occurs in vats and laboratories. Some is bubbling away in off-campus meeting rooms where creativity techniques are used as a reagent to stimulate innovation. Last spring, CIO Senior Writer Thomas Kiely sat in when marketing teams from du Pont and one of its customers, textile weaver Guilford of Maine, met to cook up new-product ideas. Although he was constrained from revealing the specific ideas that resulted from the two-day session, he learned how some companies are tapping into their employees' creative potential in new and focused ways.

"The Iceman Cometh" was the diverting headline *USA Today* ran over a story about cold weather one day late last March. Most of the paper's readers might have smiled at the reference or used it in conversation at the office. But for six people gathered in a small hotel in southern Pennsylvania, the headline was meant to stimulate the creative juices.

The six were managers and technicians from two companies: E.I. du Pont de Nemours & Co. Inc., of Wilmington, Del., and Guilford of Maine Inc., a large textile manufacturer (and du Pont customer) located in the town for which the company is named. Cloistered in a corner of a small conference room and surrounded by flip charts, they were trying out novel ways to spark fresh ideas for new products. They read out loud randomly selected headlines from the newspapers and then called out whatever associations entered their minds.

Thus, read one of the group members, "The Iceman Cometh."

After a moment, somebody said, "an insulating fabric." "Cooling fabrics," suggested someone else. And then the ideas rolled from the group like a bag of marbles emptied onto a table. Water resistance. Atmospheric fabrics for use in weather balloons. For air conditioning. Acoustical-insulating fabrics. Sound-dampening fabrics used in ducts. Climate carpeting for theaters. Microbe-eating fabrics. Bug-zapping fabrics....

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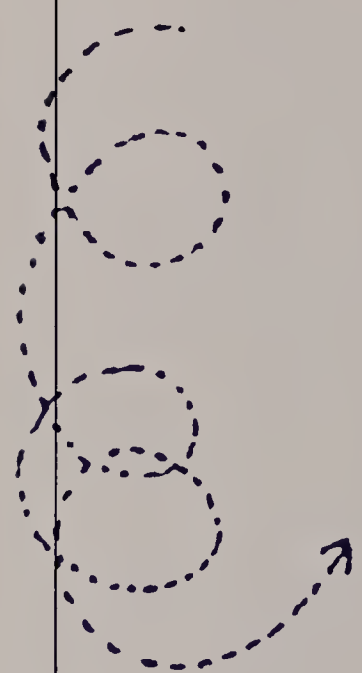
THE PROCESS steers a group through exercises that challenge people to seek unusual, creative ideas, appraise their potential as valid business propositions, narrow the list and set the steps needed to bring the selected ideas to fruition.



CREATIVITY TECHNIQUES AREN'T sorcerous arts. In fact, du Pont's creativity guru, who led the session, developed a pragmatic, business-focused problem-solving process that enhances business communications across different functions or organizations. The headline exercise was a small part of a two-day meeting involving 24 participants (including four facilitators) from the two companies. They convened in Mendenhall, Pa., near the Delaware border, to dream up innovative ideas about how the companies could make money together. The participants used a number of creative problem-solving techniques—such as free association—to push their imaginations out of habitual ruts in the search for fresh ideas.

Although several du Pont managers attending the meeting were familiar with the process, it was new territory for the group from Guilford. "I had never been through anything like this before," said Mel Schierman, Guilford's senior vice president of design research. "It was terrific. We've done [group] brainstorming before, but never formal problem-solving [sessions] like this."

Basically, the process that Schierman and other managers commend steers a group through a series of exercises that challenge people to seek unusual, creative ideas, appraise their potential as valid business propositions, narrow the list and assemble the steps needed to bring the selected ideas to fruition.

Divergent and convergent thinking skills are the two strands of the double-helix structure to this process. The meeting's facilitator, Charles Prather, manager of du Pont's Center for Creativity and Innovation, opened the first day with an explanation of the theory behind the practice. (Prather has since left the company to form his own consultancy in Hockessin, Del.)

Divergent thinking, he told the group, is the wellspring of breakthrough ideas. Divergent thinking is associational, creative and unconventional. Inventors draw upon their capacity to think divergently in order to envision opportunities that most of us will miss. In contrast, convergent thinking is analytical. Managers draw upon their convergent-thinking skills to plan, organize and deliver a result.

Innovation requires both skills, Prather believes. Divergent thinking spawns new-product ideas; convergent thinking plots a path from raw vision to reality. The five-stage creative problem-solving process Prather developed draws alternately upon the divergent and convergent efforts of a group. As a package, the five stages—defining the situation, defining problems, generating ideas, finding solutions and planning actions—are intended to lead managers to actionable business solutions.

Defining the Situation

The first of these stages—defining the situation—is like the ritual that precedes a pickup ball game, where participants haggle over rules. Prompted to talk about their companies and their goals, managers broadly outlined market pressures and business expectations. (The goal of the meeting had been set beforehand: to decide upon a product, or products, that the two companies could jointly bring to market in 1993.) The primary purpose of the discussion was to acquire a general understanding of each other and set the groundwork.

For instance, it quickly became apparent that du Pont and Guilford approached this relationship with somewhat different ambitions. Guilford weaves fabric that is used to cover office partitions and office furniture; it is a supplier to such companies as Steelcase Inc. and Herman Miller Inc. It purchases fibers from du Pont and would like du Pont and other fiber manufacturers to put more money into fiber research.

Why? Guilford needs to diversify into new products and new businesses. "We supply a market that has reached maturity," Jerry Harrison, Guilford's senior vice president of sales and marketing, explained to the room at large. The white-collar office market in this country is flattening although it is still growing overseas; Guilford needs to branch out into other markets for its textiles, selling to makers of consumer or residential furniture, or to suppliers of car or truck seats and carpeting. Guilford has been this route before: Twenty-five years ago, the company's sole business was to supply woven fabrics to the apparel industry; it nearly went broke when consumers—and then Guilford's customers—discovered synthetics.

Du Pont, on the other hand, wants to sell more of its amarid fibers (a lightweight, fire-resistant product). They are more expensive than other fiber products that Guilford and other companies use to weave textiles, so sales have grown slowly. To speed sales, du Pont believes that companies like Steelcase

need to be convinced to design and sell to white-collar office workers products incorporating fabrics woven from du Pont's fire-resistant fibers. Guilford could help sway Steelcase and other companies by offering a broad array of these fabrics for designers to choose from, explained Roszann Graham, du Pont's business director for amarids. Then amarids-based woven fabrics would then seem less like an exotic niche offering.

Defining the Problem

This free-flowing discussion set the stage for the second step of the process: defining the problem. The two companies' employees were supposed to determine the challenges and opportunities they faced. Prather's approach involves using a fusion of divergent and convergent thinking: a simple brainstorming technique coupled with a procedure for achieving consensus.

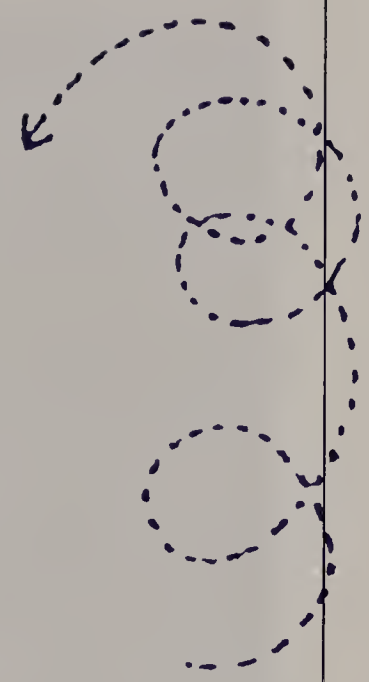
Prather created a framework for the brainstorming part of the process by asking participants to complete the phrase, "Wouldn't it be nice if..." during the free-flowing discussion in which the situation was defined. Rather than limiting their responses to the obviously pragmatic, group members were encouraged to voice daydreams, hopes and prayers. For instance, as one Guilford manager explained the company's manufacturing cycle to the group, a colleague wrote, "Wouldn't it be nice if we could reduce actual manufacturing lead times to meet JIT requirements?" Others wrote notes wondering if conflicting governmental standards in global markets could be streamlined, or if Guilford could supply complete office components rather than just the fabrics.

When this discussion ended, these jottings—175 in all, each written on a separate Post-it Note—were collected, read aloud to the room and stuck on a wall. Although some of the ideas were saccharine and general ("Wouldn't it be nice if we found ways to leverage our joint company skills with a positive emphasis on risk-taking"), others were specific and fresh ("...if panel fabrics could absorb odors and keep office environments clean"; or "...if the end user could control the color of fabrics and fabrics could easily change color"). Many ideas overlapped, especially in areas of keen interest to Guilford—niche products aimed at industry segments, such as airlines.

Next, the group needed to narrow down and prioritize these suggestions. At Prather's prompting, the entire assembly gathered around the notes, fixed upon several feet of wall, and tried to cluster similar ideas. The process seemed chaotic: Some managers formed groups, picked a topic, then sought ideas that fit; others wandered like lone wolves through the gathered ideas, plucking a Post-it away from one group and depositing it somewhere else.

In the end, a rough consensus emerged around 10 clusters of ideas. By a vote, three were selected for further consideration.

One of the three clusters drew upon a Guilford manufacturing strength and could generate new, unique products and services; the second involved a new marketing tack that could lead to diversification; the third capitalized upon a growing trend for the 1990s. Each of these clusters could lead to the development of products deliverable in 1993, could prove to be beneficial for both companies and had a high probability of success.



PARTICIPANTS IN THE SUBGROUPS WERE ENCOURAGED to set aside pragmatic instincts, transcend mental inhibitions and let their minds wander in search of previously unimagined ideas—though within the guidelines of the issue.

Idea Generation

On the second day, the participants reconvened and divided into three subgroups, each choosing one of the three clusters selected the previous day. Creativity facilitators from du Pont led the subgroups through the third stage—idea generation. In this stage, the idea clusters that had emerged casually from the discussion about the business situation—and were then narrowed and focused when defined as problems—were to be exploded once again.

It was a controlled explosion. Participants in the subgroups were encouraged to set aside pragmatic instincts, transcend mental inhibitions and let their minds wander in search of previously unimagined ideas—though within the guidelines of the issue. For instance, if one of the three selected topics had been how to use information technology to strengthen business links between the two companies, the managers would have been encouraged to think beyond electronic invoicing or inventory-replenishment systems and to seek instead the original and the outlandish. But they were not to stray from

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the topic into discussions of odd, new virtual teams or innovative joint-marketing arrangements, for example.

The facilitators introduced several thought-stimulation techniques to help the subgroups escape from mental ruts—the use of the newspaper headlines was one such technique. Another exercise required managers to describe the feelings evoked by pictures clipped randomly from magazines. One Guilford manager gazed for several moments at a picture of a long beach, perhaps in Hawaii, populated by a few swimmers and sunbathers. Boats with brightly colored sails skimmed across the water. Then he wrote:

THE PROCEEDINGS WERE NOT EXACTLY SEAMLESS. From the start, the du Pont managers—with their broader experience in these types of meetings—seemed to dominate conversations, even if only subtly. And there were signs that employees from the two companies never meshed entirely: In one subgroup, du Pont employees sat on one side of the table, Guilford employees on the other.

"relaxed, warm, luxury, natural beauty." The managers then swapped written impressions and freely associated product ideas from the words evoked by the pictures. The mental leaps this required sparked several innovative notions. The Guilford managers' impressions of the beach scene were passed to a du Pont manager, who studied the words and then jotted down several ideas, including "dehumidifying fabric panels." Another group used words picked at random from a dictionary for the same purpose.

Finding Solutions and Planning Actions

After two hours of these mental gymnastics, the three groups had hundreds of ideas. Some were bizarre, others dull or dreamy or spurious, and some were quite clever. It was time to winnow the list again—first into clusters, then into priorities that were voted upon in rounds, punctuated by discussions that became increasingly analytic. This was done in the fourth and fifth stages—finding solutions and planning actions.

In the fourth stage, each of the three subgroups clustered and narrowed its ideas using the same "voting" methodology that the group as a whole had used in stage two. Each group came up with three specific new-product ideas to pursue.

In the fifth stage—planning actions—the subgroups identified likely sponsors and generated lists of internal groups or outside organizations that would need to be recruited, stroked or circumvented for each product.

Finally, the three subgroups reconvened in a conference room, where representatives from each presented conclusions to the group as a whole. All the participants—who were visibly exhausted after the two days of work—assessed the trio of objectives, swapped contacts and ideas, and agreed upon the steps that would be taken in the weeks ahead.

Aftermath

Of course, the proceedings were not as seamless as this short description might indicate. From the start, the du Pont managers—with their broader experience in these types of meetings—seemed to dominate conversations, even if only subtly. Guilford's Schierman said later that he "felt comfortable with the process—that we were not being used, commercially, and that there was a true partnership going on here." But employees from the two companies never meshed entirely: In one subgroup, du Pont employees sat on one side of the table, Guilford employees on the other.

What's more, the ideas that emerged in the end were not breakthrough innovations (no Sony Walkman or Federal Express overnight-delivery service was born at this meeting). Despite its emphasis on bringing down mental barriers, the process has a bias toward pragmatism and action; what's tenable isn't always novel. And the goal set at the beginning of the meeting (a new product in 1993) forced the group to focus on low-hanging fruit. Still, before the Guilford managers left the meeting, they made certain that they could take possession of the hundreds of idea-populated Post-it Notes generated during the two days.

In the end, however, the real issue for both du Pont and Guilford was whether the ideas hatched in Mendenhall would ever come to fruition. Nearly three months after the Guilford contingent bid goodbye to its du Pont hosts, Guilford and du Pont managers have postponed work on one of the three ideas and have concentrated their joint resources on the other two. "Things aren't moving as fast as I had hoped, but they're moving," said Bill Foley, director of advanced products at Guilford. "And we definitely will reach our goal by the end of the year." CIO

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George Brenner
Director of Corporate Information Services, MCA, Inc.

A CONTROLLING INTEREST

Centralized management of distributed systems is a frustratingly elusive goal for those taking the client/server plunge. In this month's "Second Opinions," five seasoned executives offer advice to a CIO in the process of migrating to a distributed Unix environment.

BY RICHARD PASTORE

MANY CIOS DREAM of downsizing to distributed systems and client/server environments, drawn in by the promise of rapid responsiveness and eventual economies. But all experience the same rude awakening: The stuff is a nightmare to manage. "We've tried to manage it by brute force because we haven't found tools to address these issues for us," said Richard Lester, vice president of IS at Seattle-based Associated Grocers Inc., a wholesale grocery cooperative. "We want tools for centrally controlling things like scheduling, security and diagnostics."

To reduce the time it takes to get groceries from manufacturer to store shelf, Lester's team is migrating to a distributed Unix environment. TCP/IP local and wide area networks link IBM Corp. RS/6000s, NCR Corp. 3000s and Hewlett-Packard Co. 9000s in three warehouses and 350 independent West Coast grocery stores and corporate offices. The ultimate goal is a quick-response, automatic-replenishment system fed by store-gathered sales data.

Associated Grocers has little time left to grouse over the lack of off-the-shelf tools. All mission-critical systems will have been developed for client/server by the time this article appears. "Then, as we start moving transaction volumes over from the mainframe, the risk factor will start going up," Lester said.

The firm's IS team has bashed out some management facilities on its own, none ideal. With no isolation diagnostics, IS had been forced to bring down and recycle all 50 distributed brokers/servers whenever one had a

SUBJECT

Associated Grocers Inc., Seattle
Industry: Cooperative grocery-store wholesale
Revenue: $1.2 billion (sales)
Employees: 1,300
Client/server users: 500 at 350 sites
IS staff: 80
IS executive: Richard Lester, vice president of information services

OBJECTIVES

- **Finish client/server migration in 18 months. Reduce inventory cycle times and establish automatic replenishment**
- **Centrally control distributed systems management economically on behalf of independent-grocer membership**
- **Avoid piecemeal management solutions requiring continual tailoring or wasteful replication**

CONCERNS

- **What models or techniques can help us achieve centralized client/server management?**
- **How can we monitor, isolate and diagnose distributed server problems?**
- **Are there reliable products that will work across our systems and adhere to our OSF Distributed Computing Environment protocol?**

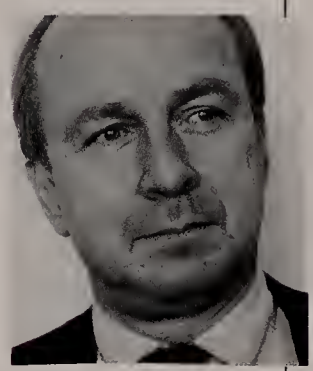
PHOTO BY RAYMOND GENDREAU

RICHARD LESTER: *"We want tools for central control."*

LEN MILLER
MetLife Insurance Co.

BO SWANSON
United HealthCare Corp.

WAYNE SCHMIDT
United HealthCare Corp.



JOHN MANN
Yankee Group

CHIP STEINMETZ
First Boston Corp.

problem. An internally written Unix script now allows individual diagnosis, but the script must be retrofitted to each new application—rendering it a maintenance burden in itself. Likewise, a Unix program to centrally control tape and transaction-log backup is proving problematic with the increasing profusion of servers.

The Associated team has heard about and/or tested a few Unix-based management tools, Hewlett-Packard's OpenView and Computer Associates International Inc.'s CA-Unicenter for Unix among them. But most packages are immature, Lester said, and none seems to be the magic tool. He has also implemented a three-tiered client/server concept from Open Environment Corp. of Cambridge, Mass., but he has not yet leveraged it in managing the overall network. In the meantime, he is eager to learn what tools or techniques others use when the dream world of client/server turns into harsh reality.

- **How can we implement security and backup without doing it application by application?**
- **Should we share some of the management responsibility with users/customers?**

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EDS

Len Miller, *CIO and vice president of personal insurance, MetLife Insurance Co., Bridgewater, N.J.*

We've had to forgo Unix in favor of an OS/2- and Windows-based client/server system because we have to support 10,000 DOS-based portables in the field. But our situation at MetLife matches Associated Grocers' in that we both have to support hundreds of scattered user groups that have no resident network administrator to handle LAN-management duties. With 1,000 sales offices to connect, it would be impractical for us to hire and train local administrators. So the model we've adopted is to automate, simplify and remotely manage all network-management functions from a single central location. If you want to avoid placing an administrator in each of your grocery locations, Mr. Lester, you're going to have to look to this type of solution.

To make this work, we had to write an awful lot of management software—and it's been difficult. But once that software is written and in place, local LAN administration is much easier. These management programs reside on all our systems. They run as kernels on the local servers and are linked to each other by a central shell, which operates like an integrated set of utilities and also resides on all our systems.

Here are some of the automated management utilities we've written:

Local backup enforcement: Users tend to disregard the importance of backing up, so we developed a program that automatically alerts them if they skip one daily backup. If users still fail to back up, then next time they log on, the only screen available to them is the backup screen.

Print manager: Our sales offices handle a great deal of printing from many sources, so we developed a program to manage the print queue effectively. Our software prevents one user's job from being merged with another's, and it automatically formats data for the selected printer.

Security: When client/server users log on, the system prompts them to answer three or four questions to verify their identity and clearance. The system randomly selects these personal questions from a group of 100, so it's unlikely an unauthorized user could predict what will be asked and come up with a correct guess. If the user misses any of the answers, the session disconnects automatically.

LEN MILLER: *"We had to write an awful lot of management software, and it's been difficult."*

PHOTO BY KENT HANSON

Software distribution and version tracking: With all our remote locations, it's tough to physically distribute software and keep it current. We are now automating distribution by sending software through the network to the various LANs. When office nodes or dial-in portables log onto the wide area network, our controls will check to see they are running the most current program versions. We could enforce version control by locking up the system, but we don't feel the need.

System monitoring: Error logs continuously read the remote logs. Some monitoring is event-based; threats to the integrity of the system immediately fire off alerts. Other monitors take random peeks at what's going on in the system.

To be honest, not everything we've tried has worked, and new situations to resolve are constantly appearing. The complexity of administering a large network demands that you look at it as an ever-changing, flexible thing. One strategy that might help you is to test your systems in small pilot programs in a few locations. We phased in systems slowly in 10 sales offices and left the users alone for a long time. Then we got our developers together with them to eliminate all the bugs we had found. This took us about a year.

I agree with you that off-the-shelf management products would be the

"The model we've adopted is to automate, simplify and remotely manage all network-management functions from a single central location."

–Len Miller

ideal way to go. But when we began our preparations two-and-a-half years ago, we found the packages were too general to do the job. For instance, there were backup products, but they didn't enforce remote backup. Even though more shrink-wrapped options exist today, you may still have to modify them to get the functionality you require.

Bo Swanson, *project manager of distributed computing, United HealthCare Corp., Minneapolis; and* **Wayne Schmidt,** *systems manager for United Behavioral Systems, a subsidiary of United HealthCare, also based in Minneapolis*

We faced the same management issues as Associated Grocers when we began our Unix-based client/server pilots a year-and-a-half ago. Like the cooperative, United HealthCare has many far-flung, independent users. We provide administrative services for health plans, run a managed-care business and manage employee-assistance programs and HMOs. Our first client/server project was an IBM RS/6000 artificial-intelligence system that automated claims reviews. We needed management products compliant with the Open Software Foundation's Distributed Computing Environment (DCE) protocol that would centrally control our TCP/IP networked systems. Not finding any, we had to write our own. What made it easier are two models we've chosen to follow corporatewide.

The first is organizational. We concentrated management responsibilities in a separate core group of IS personnel, our Advanced Technology Group. This relieved our application developers of the burden of designing security, monitoring and other management features for each distributed application. You can't throw everything at the developers, or they'll drown. Let them focus on application functionality and how the business works, while a separate group handles the management chores. That way your programmers will get up to speed faster in the new platforms and languages—our behavioral health unit developers got an application running just four months after starting coding.

Segmentation also helps by ensuring management functions will be implemented and executed uniformly application-to-application and throughout the organization. This keeps things sane and will let us more easily replace our homegrown tools with packaged management products when they finally become available.

Our other model is a three-tiered client/server architecture from Open Environment Corp. In OEC's concept, a middle tier is added to house the servers and the client/server control logic, keeping it separate from the traditional front-end presentation tier (PCs, graphical user interfaces) and the database-engine tier. We understand Associated Gro-

WAYNE SCHMIDT *(left) and* **BO SWANSON:** *"Our ultimate goal is to rely on packaged management tools."*

PHOTO BY STEVE NIEDORF

cers has also implemented OEC's technology but that it hasn't implemented any management tools in the logic/server tier.

Here we've used the logic tier as an isolated location for a common set of management programs that remain constant even when we make changes in the front-end and database tiers. Because the middle tier is isolated, we can write management programs in languages like C, C++, Smalltalk or SQL, independent of the presentation or database tiers or the architectures they run under. This could help solve your problem of having to retrofit management solutions as you add or change hardware or applications.

OEC includes a tool called Netminder that can initiate and monitor DCE servers using remote procedure calls. RPCs work independently of each vendor's architecture, so you don't have to write monitoring scripts for each machine. RPCs will also automatically tell you which servers are in trouble, so you don't need to bring each one down to check.

We want to raise our hardware-monitoring capability to the next level, that of functionality monitoring, which I'm sure is a big concern for you as well. We're developing a monitor that will automatically check systems against an application-dependency list—the set of technical functions that applications depend on to operate (disk capacities and the like). If anything is down or in danger, the monitor will alert us via a central-operator display station we're building. That way, we'll be able to deal with client/server problems before end users call.

As for farming out management responsibilities to your users, you can try it, but you'll run into the problem of people doing things inconsistently. The advantage of central control is that one group is setting the standards and managing in accordance with those standards. If you give up control, you give up authority.

Our ultimate goal, like Associated Grocers', is to rely on packaged, DCE-compliant management tools. Unfortunately, the only DCE management tools that we know of handle basic services only, like global directory services. Once new products arrive and OEC's Open Distributed Evironment Toolkit Release 2.0 [due by the end of the year] is able to accommodate them, we'll implement them in our middle tier. That should solve a lot of the client/server management headaches common to both our firms.

> "You can't throw everything at the developers, or they'll drown. Let them focus on application functionality and how the business works, while a separate group handles the management chores."
>
> *–Bo Swanson & Wayne Schmidt*

John Mann, *senior analyst, Yankee Group, Boston*

As you've already seen, Mr. Lester, distributed open systems are a bit deficient in the management department. In the old IBM/mainframe environment, many management details were worked out over two decades. Plus there was plenty of revenue flow to fund development and distribution of complete management solutions. In the open-systems world, with many competitors crowding a commodity hardware market, the same high level of funding isn't there. Further, the distributed environment is inherently more difficult to manage without the security, efficiency and control of the traditional data center.

When it comes to products, you should buy only those that fit the manager/agent model. In this model, management software resides on central management stations, and agent software runs on or near the systems to be managed (such as servers), relaying management commands and data between the central stations and the distributed systems. Stick with this model; its flexibility allows for support of heterogeneous systems like yours and the addition of new tasks over time.

But at this early stage, Associated Grocers needs expertise more than it needs products. And it needs a somewhat committed partner. I recommend you seek out a vendor already expert in distributed systems, dependent on distributed computing for its future growth and strong enough to give you ongoing, long-term support. Of course, you'll have to accommodate your partner's need to make a living. A number of our clients have "adopted" vendors that have what they need, and they try to help those vendors succeed.

You might also consider outsourcing the management task for an interim period of three to five years, while expertise develops within the industry. Your agreement should include provision for switching from outsourcing to training and handholding, and then to a final takeover when you're ready. I recommend you approach any company with the expertise to handle this task, whether or not it is known for "outsourcing." The Montreal firm DMR Group Inc., Hewlett-Packard, IBM Corp.'s subsidiary Integrated Systems Solutions Corp. (ISSC) and NCR Corp. are firms you might investigate.

When it comes to remote transaction processing, a transaction monitor can help with management by providing valuable "instrumentation" around your applications: collecting transaction statistics, keeping traces and logs, etc. Without this capability, you could have trouble

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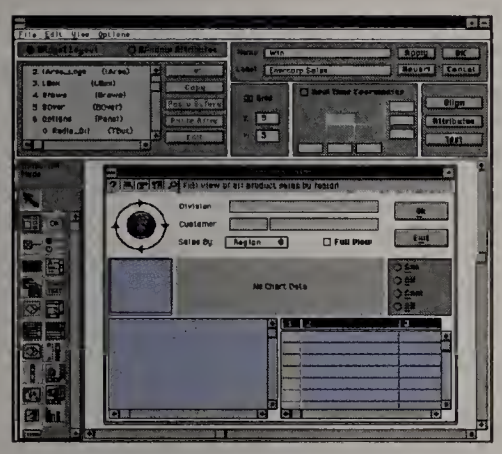

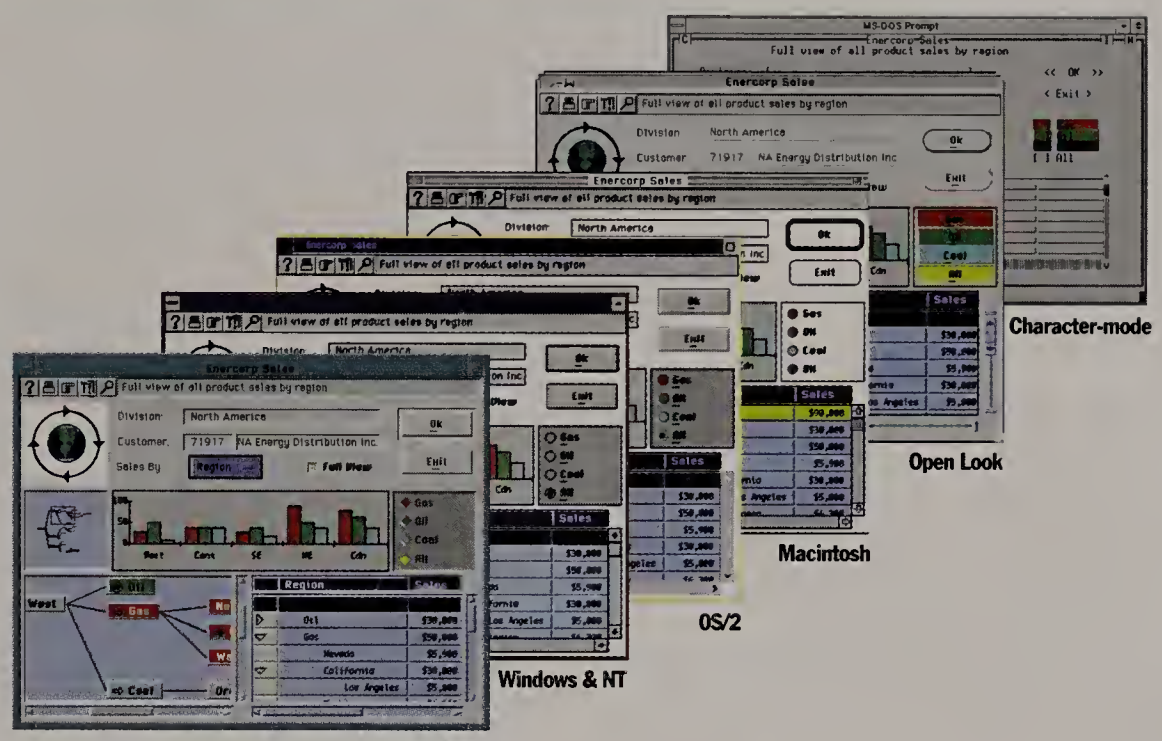

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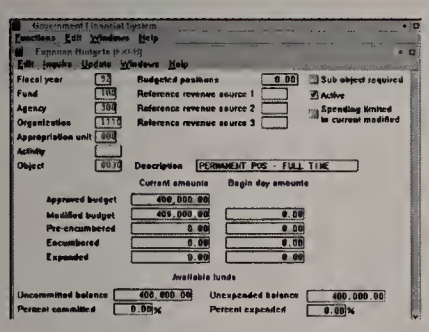

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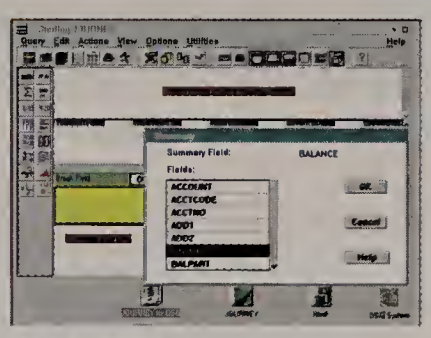

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with performance management and capacity planning as well as problem management. Unix System Laboratories Inc.'s Tuxedo or NCR's Top End are transaction monitors that come to mind, but since NCR has its own online transaction-processing engineering staff and plenty of retail-industry experience, that company may be more knowledgeable about your needs than others in the open-systems arena.

Security is an interesting problem. Being a cooperative, you may be able to distribute some financial controls—in other words, make your security management fit your organizational mold. Assuming Associated Grocers includes autonomous financial units (grocers) that have control over their own books but not over the financials of the cooperative as a whole, you would have a security-control pattern different from, say, a single hierarchical but distributed organization.

Since providing security for different application types involves different objectives and implementations, generic Unix security expertise may not be sufficient for your needs. For that reason, I again recommend getting outside expertise.

You seem committed to the Open Software Foundation's Distributed Computing Environment. While this may be a long-range goal, you might consider the manageability inherent in "message-oriented middleware." If a request and/or data must pass from computer to computer but not necessarily right away, there are middleware products that (unlike the common remote procedure call model) don't require live connections to remote nodes before sending a message. They don't necessarily have to wait for a response and can guarantee message delivery. This could make your applications more resilient to server and node crashes. I believe the market will eventually layer such functionality over today's DCE anyway.

Companies doing message-oriented middleware include IBM (through New York-based Systems Strategies Inc.); Digital Equipment Corp. of Maynard, Mass.; Micro Focus of Palo Alto, Calif.; San Francisco-based PeerLogic; Horizon Strategies Inc. of Needham, Mass.; Momentum Software Corp. of Englewood, N.J.; Suite Software of Anaheim, Calif.; and Teknekron Corp. of Incline Village, Nev. The list will be longer tomorrow. In the meantime, hang in there and seek a good vendor partnership.

Panelists' Findings

- **With many dispersed sites, it's necessary to automate all management functions remotely.**
- **A three-tiered client/server model provides an isolated location for management logic that helps it remain constant despite changes to other system components.**
- **A manager/agent model, with management controls residing on central systems and agents on the systems to be managed, provides the greatest flexibility.**
- **Event-based monitoring, with alarms triggered by actual system events, helps avoid the confusing flood of false alerts common with continuous, network-based monitoring. A combination of the two might work best.**
- **Concentrating management responsibilities and expertise in a core IS group leaves other programmers free to work on applications.**
- **Granting users control over management functions invites inconsistency and loss of authority.**
- **Management tools, like client/server systems, should be phased in gradually and tested in small pilot projects.**
- **Packaged management tools are ideal, but they are not widely available or mature and may be too general for specific needs**
- **A partnership with a vendor committed to client/server can be mutually beneficial.**
- **Management duties could be outsourced while the IS staff builds its own expertise.**
- **Products worth investigating include message-oriented middleware; Unix transaction monitors such as Unix System Labs' Tuxedo and NCR's Top End; and network-management tools such as H-P's OpenView and CA's CA-Unicenter.**

> "At this early stage, Associated Grocers needs expertise more than it needs products. And it needs a somewhat committed partner."
> *–John Mann*

Chip Steinmetz, *chief technology officer, First Boston Corp., New York*

At First Boston, we're in the early stages of building a geographically dispersed client/server system as well. We've got 750 geographically dispersed Sun Microsystems Inc. workstation nodes, 40 Sun servers and a couple of Pyramid Technology Corp. machines running trading-floor applications. While our separate business-unit development teams have been working on these applications, my group has been

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building a client/server management infrastructure to support them. We've chosen a model that differs from others in that it doesn't constantly look for signs of trouble. It's an event-based system designed to activate only when a problem occurs—a failed server, low system capacity or breach of security, for example. That way, you avoid the flood of confusing, domino-like warning messages that might be triggered under a network-based monitoring system by something as simple as a failed router.

To accomplish this, we write application programming interfaces (APIs) compatible with the industry-standard Simple Network Management Protocol (SNMP) and build them right into our distributed applications. For example, a dwindling system capacity will trigger an alert through the application's API. The SNMP-based message is automatically funneled to a central Sun computer and then redispersed to the appropriate systems administrator at the local level.

Since they are application-resident, API management functions would allow Associated Grocers to somewhat isolate its management systems from its client/server hardware. That's not as easy to do with a network-resident management system. And it's a lot easier to redo an API, which is just a few lines of code, than it is to retrofit a network-based management system for each new client/server element you introduce.

Of course, APIs won't work without management tools to communicate through. For monitoring functions, we use Cabletron Systems Inc.'s SNMP-based Spectrum network-management system and Remedy Corp.'s Action Request System. Zephyr, part of MIT's Project Athena network services system software, issues real-time notifications with pop-up windows to client/server workstations. We managed to tie all these systems together through gateway APIs.

One thing about products: I recommend you create session-layer APIs above your RPCs to help shield your applications from proprietary technology. If you want to replace current products with future OSF DCE products, you won't have to change your applications, just the session-layer APIs.

> "While our separate business-unit development teams have been working on applications, my group has been building a client/server management infrastructure to support them."
>
> *–Chip Steinmetz*

We realize that systems-management products are just now starting to emerge, and standards are coming along like DCE, the OSF's Distributed Management Environment and other network-management technologies. The problem is how can you build an infrastructure now and maintain compatibility with products you'll want to buy later? You can do that by concentrating on APIs and the SNMP standard.

While we've figured out performance monitoring and problem isolation and begun work on security, we haven't implemented client/server diagnostics or backup yet. We deliberately started with the lower-level management functions, figuring we'd work up the scale to these other functions, which are really applications in themselves that require management. This staggered approach may work for Associated Grocers too.

Even with these higher-level functions, we still plan to stick to our event-based model. In security management, you want to detect security breaches, which are distinct events. To do this, you might have to build security APIs into each application, but again, these can be easily altered to accommodate changing security parameters. For example, we allow users to access data only if it falls within a value range for which they have clearance. We use an application API to set these ranges, which change from time to time.

Not all of our management efforts are locally based. We're building a centrally located tool to collect system alerts for use in generating overall performance reports and establishing a historical record. We use a product from OpenVision of Pleasanton, Calif., to collect this data and store it in a central Sybase Inc. server. Another centralized project we're working on will give us the ability to do backup and recovery over the network from our central site. Currently this is handled by the individual departments. We'll still let them do it, but we need that capability centrally as well, as I'm sure you'd agree. CIO

EDITOR'S NOTE

"Second Opinions" takes real-life issues facing real-life information executives and presents them to a panel of experts—IS practitioners, consultants, academicians and non-IS executives—for evaluation and advice. While our revolving panel of experts cannot explore all the possible solutions in this limited space, we hope that by suggesting a few strategies, they may contribute to a better understanding of serious, common concerns for IS executives and other business leaders. We also plan to check back with our subjects to see how they chose to address the issue and to report on their progress.

We invite our readers to offer topic suggestions and/or serve as case studies for future articles. Please contact Richard Pastore at 508 935-4435.

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GE's NEW LEADING LIGHT

According to Hellene Runtagh, her appointment last year as GE's first CIO reflects a growing belief in the importance of information management to the company's future success

BY THOMAS KIELY

ELLENE RUNTAGH, GE'S first CIO, has a long history with the company—but not in the $62 billion corporation's information systems units. Young, bright and confident, Runtagh rose through GE's business ranks as a manager in a variety of disciplines—human relations, manufacturing, product support, international operations and, finally, as president of Decimus, a unit of GE Capital. In October 1989, she was appointed president of GE Information Services, and in October 1992 she gained the additional position of corporatewide CIO.

Why did GE appoint a CIO? After all, the global industrial giant has performed extraordinarily well without one for many years. So, what changed? Why now?

In this exclusive interview with *CIO* Senior Writer Thomas Kiely, Runtagh contends that GE's top managers have high expectations for IT in the coming decade. While GE has no plans to curb its appetite for decentralization, Runtagh will look for ways to leverage the consolidated buying power of GE's 12 businesses. More importantly, she will be a technology-transfer maven, facilitating the flow of workable IT applications (and the knowledge, people and reengineering efforts behind them) throughout the far-flung corporation.

PHOTOGRAPHY BY KATHERINE LAMBERT

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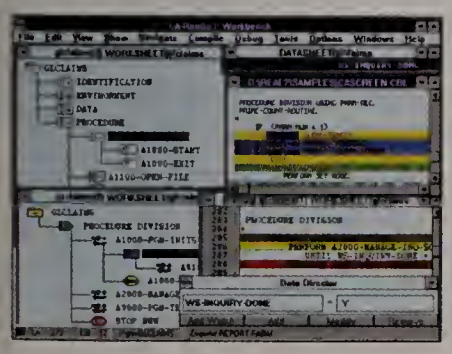

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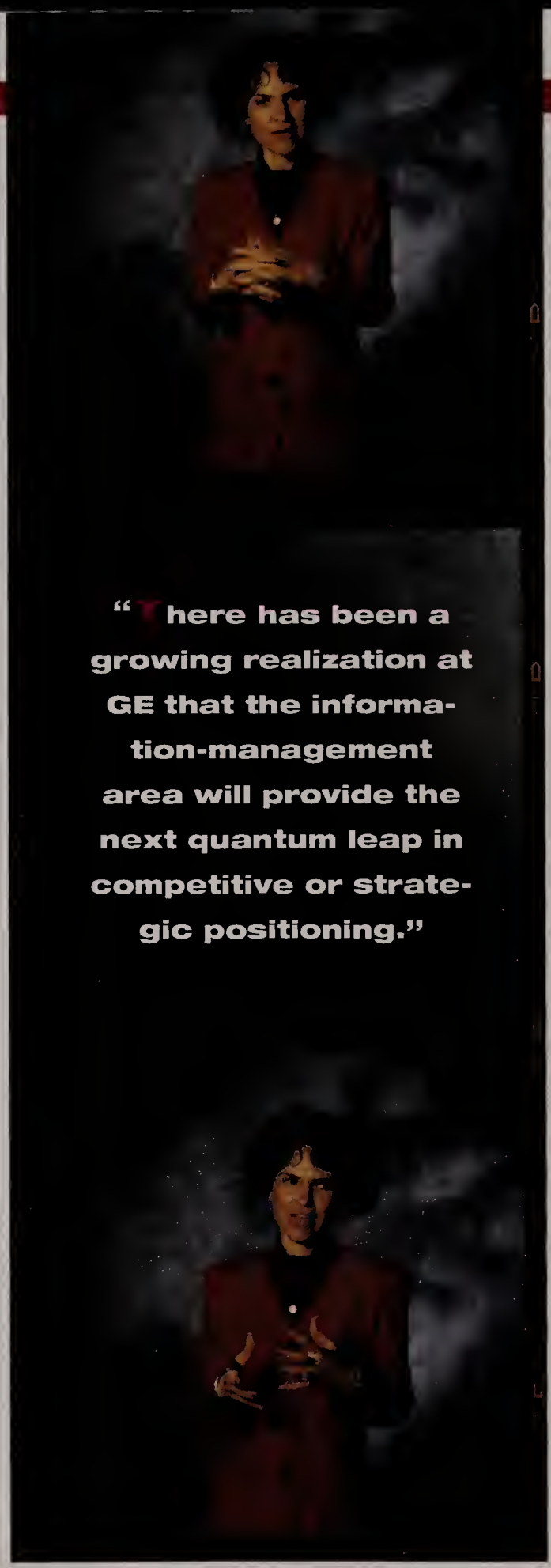
CIO: *One of your primary responsibilities as CIO is to encourage technological knowledge and experience among the businesses?*

RUNTAGH: Yes. There is an immense amount of wisdom—best practices—within GE that a CIO can harness. If you are [a leader of one GE business] and you're attempting to strengthen, say, your communication, or your productivity or your quality with your vendor community, there may be a handful of key people in another GE business who have already [accomplished what you're about to do]. These are people you can learn from; they've been there. They know what works and what doesn't work as well. So let's utilize the talents and expertise of those people as we put a similar process in place in another GE business. The idea here is to retain the independence of the decentralized GE businesses, but at the same time optimize the buying power, best practices and people expertise that the rest of our businesses can tap into.

I think that the CIO position at GE came about in an evolutionary way. When GE Information Services became the company's 13th business early last year and started sitting at the table with the other GE businesses, I think there was a greater appreciation of what GEIS is. [GE now has 12 businesses again; in early 1993, Martin Marietta Corp. acquired GE's Aerospace Division.] That change contributed to a growing realization that the information-management area will provide the next quantum leap in competitive or strategic positioning.



"There has been a growing realization at GE that the information-management area will provide the next quantum leap in competitive or strategic positioning."

CIO: *Information management?*

RUNTAGH: By information management, I mean first and foremost the process changes that a business must make and *then* the most responsive, cost-effective technology needed to execute that process. A technology system [developed] in isolation, matched against a core process, is a waste of everybody's time and money. Reengineering is a buzzword, I know—but, again, the intent is competitive thrust.

Let me give you an example: Two GE businesses [the Lighting and Appliances divisions] have done a superb job with vendor inventory-management programs. This is their differentiation. The small, regional players that make up the distribution channel for appliances, for instance, can no longer afford warehouses filled with inventory. So GE has gone in and said, "We're going to give you a system that allows you to look like you have warehouses filled with inventory. You will get real-time information on when you can ship [items] and when you can tell your end user that it will be on his or her front porch."

These inventory-management systems are strategic weapons that allow the two businesses to be more competitive. This is what we mean when we talk about sharing best practices. It is saying to the other GE businesses, "You are constantly looking for ways to differentiate yourself and to add value for your clients. Here are some things [used elsewhere in GE] that have worked."

CIO: *Will each of the GE businesses continue to run its own IS organization?*

RUNTAGH: Absolutely.

CIO: *But do the heads of those IS organizations now report to you?*

RUNTAGH: They have a dual-reporting relationship. They report to their business leaders—they are members of those business teams—and have a dotted line to me. An exciting part of the challenge ahead of us is to ensure that our information-management initiatives are first and foremost integrated with [the strategies of the individual businesses] and that our information-management leaders are integrated with the business teams—are part of the teams that design, conceive and execute the strategy for those businesses.

CIO: *You have a dual-reporting role now, too. As head of GE Information Services, you report to Chairman and CEO Jack Welch. As CIO, you report to CFO Dennis Dammerman. How is that working?*

RUNTAGH: You couldn't do two very different jobs unless you were very empowered. I don't spend my

time answering a hundred questions for multiple bosses. GE [managers] empower you; they trust you.

CIO: *So, what's on your plate for the next few months?*

RUNTAGH: We want to continue an existing thrust to decentralize information—to move information where it belongs—and to start some application movement. That means we will become less mainframe-intensive [and use more distributed technologies]. So we will continue this thrust, business by business. Everyone has their own individual plan, as well they should.

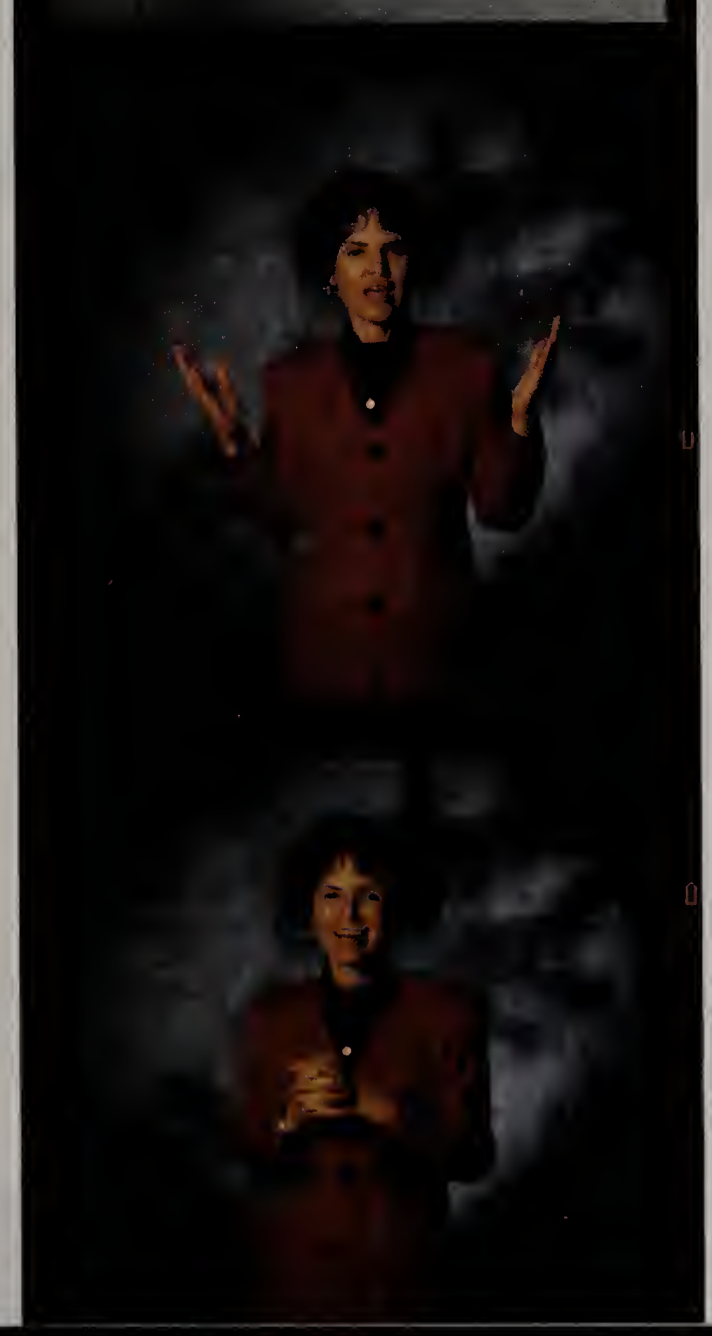
Second, as I mentioned, are the information-management priorities: What are the high-priority programs my information-management team should be working on to help my business improve productivity? This includes productivity within my four walls and between me and my trading partners. Or it could be productivity gained by adding value to core products and services.

CIO: *Are you looking for areas to consolidate?*

RUNTAGH: We're not doing major consolidations. As CIO, I have a corporate-applications group of about 200 software-development people who worry about the GE payroll systems and so on. So the decisions about what should be consolidated have been made already, for all practical purposes. What I am trying to find are instances where, say, a business is just starting on a massive spec to bring in or write a new order-entry system, and another business may have just [implemented] one. So, what can we borrow? What can we learn? Can we borrow a few people? That's the transfer of knowledge, the transfer of wisdom and best practices.

Commodity stuff you can centralize: A payroll system for a business is a commodity. We have already taken the commodity stuff out of the businesses, and if there are others that have yet to surface, we'll take those out, too. But the decision-support systems, the transaction-intensive systems, the heartbeat of that business will stay with the business; it absolutely must.

"The difficult part of information management is not necessarily figuring out frame relay versus ATM. The real issue is the application of technology: when, where and how."



CIO: *Do you foresee battles with other managers over suggestions that they pursue technologies they haven't considered? Or that they share their people with another division?*

RUNTAGH: I haven't seen it yet.

CIO: *How do you operate as a CIO in this decentralized environment?*

RUNTAGH: We have a platform—an information-management council that meets, at a minimum, on a quarterly basis. These are intensive day-and-a-half meetings involving the top information-management leader from each of the businesses and other key people as required. For example, GE's chief financial officer, Dennis Dammerman, will be joining us for part of the next session. These aren't tea-drinking ceremonies. They are sessions where we work on the right issues, understand the right best practices and decide, for example, on whether we need a center of excellence in this or that area.

In a place like GE, with its size and scale, you don't need consensus. If we decide that some of the businesses need strengthened focus in [select] areas, we can ask which GE business is doing that area best, who has the people talent in that area, and then decide to turn that [business] into a center of excellence. We can do that easily. If a couple of large businesses have this requirement, you have the critical mass you need to execute. We're not going after 100 percent consensus.

CIO: *You've mentioned best practices. GE, as a corporation, does a lot of benchmarking. Did your bosses benchmark the CIO position against other companies before they hired you?*

RUNTAGH: No. They did not go out and chat with CIOs. I think they did it the right way. They said, "We believe information management is the next

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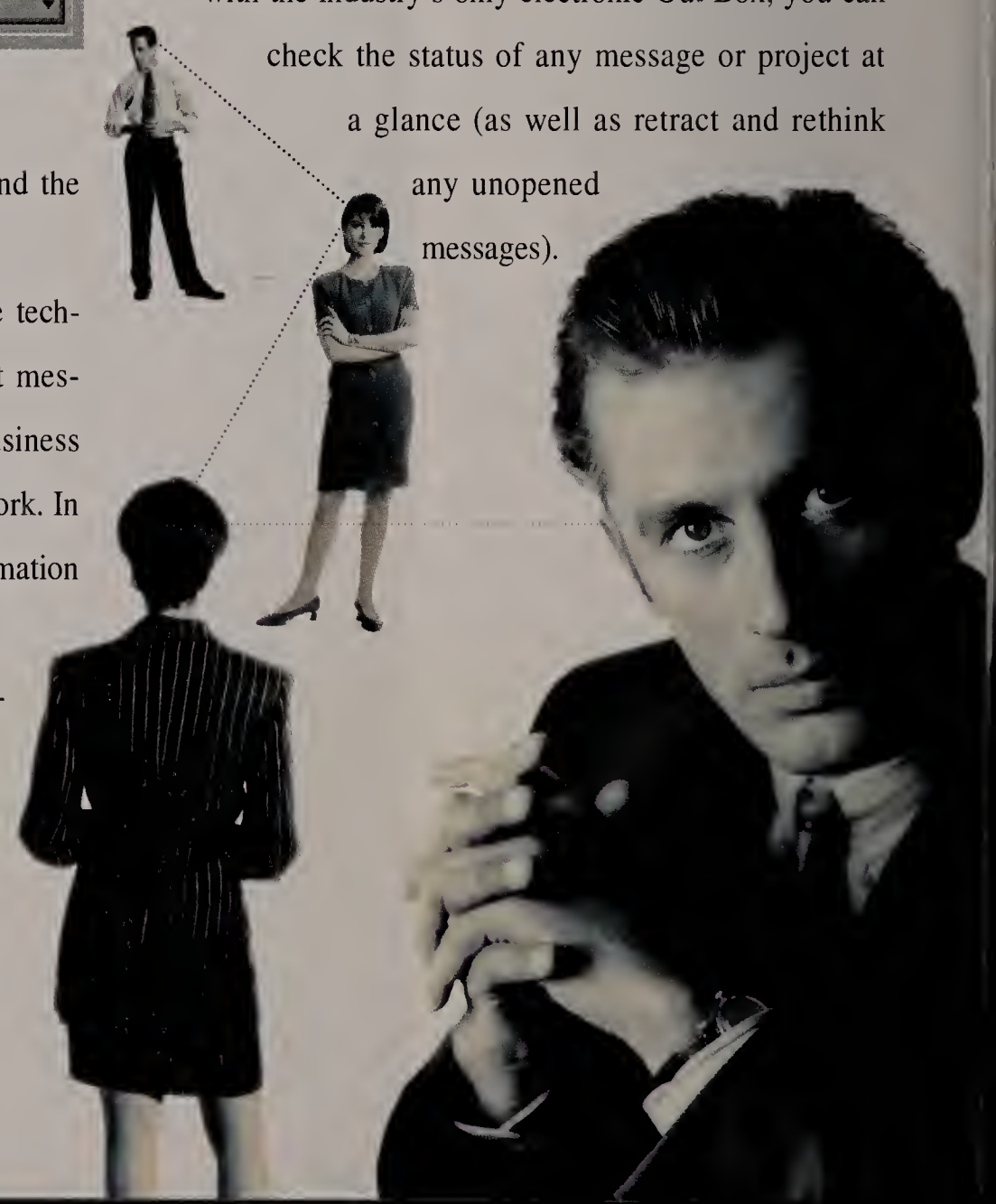

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big hurrah, and we know today that we are not optimizing it to the fullest. We know we can; we know we must; we know we will. Let's go do it."

CIO: *With your elevation to the position of corporatewide CIO, has GE Information Services also gained an expanded IS role in the corporation?*

RUNTAGH: No. That's a very good question. I got a new job; GE Information Services didn't. The integrity of GE Information Services, as a business that is externally focused, is alive and well. [GEIS provides EDI and other electronic-commerce products to about 14,000 trading partners. Runtagh learns much about IT solutions from customers but must maintain the confidentiality of her clients, even within the walls of GE.] From a business standpoint, I don't see the new role as adding an opportunity that we didn't already have, because GEIS, not surprisingly, has won all the EDI-based solutions at GE. Not because we're GE, but because we're the best solution provider available. We got the orders the hard way: We won them.

CIO: *You grew up on the business side of GE, not the IS side. How do you stay informed about technology?*

RUNTAGH: I have a very, very good staff, both in my CIO role and in my GEIS role. They educate me, and I listen to them. I do a lot of reading; I listen to my clients. Again, the difficult part of information management is not necessarily figuring out frame relay versus ATM [asynchronous transfer mode]. The real issue is the application of [technology]: when, where and how.

One thing that I am focusing on heavily—and I have the support of the business leaders, the CFO and Jack [Welch] on this—is getting two-way movement between the information-management talent and GE. We want to move non-IT people into key information-management leadership jobs. I'm a prime example of that. You need to have the right business leader, one who has an appreciation for information management and understands how it would help him or her from a manufacturing or marketing standpoint. You don't need the individual who has spent 20 years immersed only in technology. But we also want to take key information-management leaders—some of whom are top-notch business leaders—and get them into non-information-management jobs. The more business talent an information manager has, the more excited he or she is to do that. We're just starting that process.

"The assumption that you have to get somebody from IT to be CIO says that a person who brings a balance of both perspectives to the party is not available."

CIO: *There are those who would charge that the appointment of a non-technical CIO is misguided. The technology changes fast, systems are becoming ever-more complicated, and only a technology-savvy person can navigate these waters. How do you answer these critics? What do you say to people who wonder why GE chose a business-side person for the job rather than someone from within the IS function?*

RUNTAGH: If you [give the CIO job] to a business type who wouldn't know a PC if he or she tripped over it, it's hard not to agree with that criticism. I think the answer is that you need a business leader with business savvy and business understanding who is integrated in the business equation *and* who has an understanding of and an appreciation for information technology.

I absolutely agree that it would be inappropriate to have an individual as CIO who doesn't have a clue about ATM or relational databases, or issues like workstation client/server configurations versus the mainframe. On the other hand, the assumption that you have to get somebody from IT says that a person who brings a balance of both [perspectives] to the party is not available. I have many colleagues, many clients, who are excellent business leaders and who have an appreciation for the value and the benefit of information management. We're talking about technically astute business leaders. Also, by being a business leader, you bring clout to the CIO role, in terms of how it is viewed by other business leaders within the organization. CIO

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SOME HYBRID SPECIES OCCUR BY MEANS OF NATURAL selection; others must be bred and nurtured. One type of hybrid increasingly appearing in IS circles is the "bridge" position that requires skills from both the technical and management disciplines. For students interested in careers that bridge the traditional gap between IS and business, the School of Information Studies (IST) at Syracuse University in Syracuse, N.Y., may be the ideal breeding ground.

"We're a business-oriented professional school," said IST Dean Donald A. Marchand. "[Our] goal is to produce graduates who can use information technology and resources in ways that either add value to an organization's products and services or enhance the way people work." The core curriculum in both the undergraduate and graduate programs (the IST also offers a certificate program) emphasizes the value, collection, management and strategic importance of information from the perspective of users. Additional courses covering technology and financial and communications issues round out the IST's interdisciplinary approach.

According to Marchand, the IST was designed for students who want to pursue a variety of careers in computing, telecommunications or information management without adhering to a purely technical path. Yet he believes that the skills acquired at the school provide a good launching pad for other careers as well. Kevin Waldman, who received a bachelor's degree from IST in 1992 and now works as a financial information specialist at J.P. Morgan in New York, agreed. "Every organization has information needs, and starting out with a slightly technical background has been advantageous to my career," he said. "I understand how technology works, and I can apply my knowledge in a business environment." Waldman's responsibilities at J.P. Morgan include assessing corporate business needs and determining what technical solutions will prove the most cost-effective.

BY MEGAN SANTOSUS

PHOTO BY JAMEY STILLINGS

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KEVIN LOPATIN *takes his hat off to his alma mater.*

CIOs have long been advised that they should complement their technical knowledge with interpersonal and management skills. These days, even entry-level IS staff such as programmers and systems analysts need a similar range of capabilities to help them work with users from other departments developing systems that fill different functional needs.

The IST, formerly known as the School of Library Science, has offered degree programs in more-traditional areas of information-related studies for several decades. In 1974, the school adopted its current name to reflect the increasing importance of information and technology in society, and it has continued to develop programs to correspond with IT trends. In 1981, the IST became the first school in the United States to offer a graduate-degree program in information resources management (IRM). Its aim: to provide students with expertise in information technologies, strategic information management and the use of information resources. To broaden their backgrounds, IRM students take courses at other graduate schools within the university, such as public administration, management or public communications.

Dave Davidson, director of operations planning and support for Sprint Corp. in Kansas City, Mo., sees the IST's interdisciplinary approach as comparable to a traditional liberal-arts education in breadth, but more practical. "The classic liberal-arts student used to be well-versed in different cultures, disciplines and histories," he explained. "But as specialities got more technical and defined, that approach subsided." Davidson, who holds a doctorate from IST, believes the program produces graduates with the kind of broad-based backgrounds that employers will be seeking for the next 30 to 40 years. And like Marchand, he does not think IST graduates are limited to IS careers. "We've got one IRM graduate [at Sprint] who is on a career path in operations," he said. "I think [IST graduates] would do well in roles like marketing or product management that require a breadth of knowledge."

WORKPLACE DEMANDS have changed, and the IST has tried to keep pace by developing new courses and programs. One of the most far-reaching of those changes has been the expanded role of information. The school has established a bachelor-of-science program designed to teach students the value of information to individuals, organizations and society. Recognizing that information no longer has a single purview, the program combines a heavy dose of liberal-arts courses with classes in information systems and management.

Technical as well as cultural advancements are reflected in IST courses. The school recently rounded out its graduate curriculum with a 15-credit certificate program in information systems and telecommunications management, covering the management of local- and wide-area networks, regulatory issues, and the integration of voice, video and data, among other topics. Last month, the IST added programs in telecommunications and network management, as well as an on-site certificate program in Washington for federal IRM. And the 1994 academic calendar is expected to include graduate and certificate programs in software management.

According to Assistant Dean Barbara Settel, staying current with technical developments is one of the biggest administrative challenges faced by the school. To keep in touch with the needs of real-world practitioners, the IST recently organized an advisory board comprising senior-level IS executives and consultants. Board members comment on current programs and propose changes to the curriculum. The school also constantly evaluates the utility of its offerings by tracking its students during their sojourns outside the halls of academe. Organizations that sponsor interns and co-ops are encouraged to provide feedback about the skills and performance of students, and IST faculty members visit sponsoring organizations.

PHOTO BY KENT HANSON

IST students can choose to follow a technical or management track, but they must take courses in both areas. This dual emphasis appealed to Kevin Lopatin, a 1990 graduate of the IRM program and currently a senior business systems analyst with EMI Music, a worldwide music company based in New York and London."The best courses I took were those that focused on how information is used by people," Lopatin said. Two of his favorites looked at user behavior—with special emphasis on how users process information. The skills and insights he picked up have come in handy: His job supporting and developing three corporate databases involves interactions with users in 40 countries.

Miles Braffett, EMI's director of marketing systems, said Lopatin is particularly adept at communicating with people, resolving their problems and smoothing over the political rifts that inevitably occur. "He's responsible for the legal clearing system for all our recordings," Braffett explained. "It operates in a distributed-PC environment that requires Kevin to interact with a wide range of people, from the chief counsel down to the system operators."

> *"The best courses I took were those that focused on how information is used by people."*
> *–Kevin Lopatin*

"The role of IS [has] tended to be telling users what they needed and then translating those needs into a system," said Lopatin. "The IST approach shifts the focus to users and how IS people can interview them to find out what their needs and problems are." Teaching students how and why people use—or do not use—information is integral to the IST's educational philosophy. Cultural, social, political and psychological issues are stressed, and Marchand believes this emphasis puts his school at the forefront of institutions preparing the new breed of IS professionals. "To users, it doesn't really matter if an environment is mainframe- or client/server-based," said Lopatin. "All they want to know is how to get the information that they need."

Marchand believes that demand for bridge professionals will rise as organizations increasingly turn to IT to help them reengineer, downsize or restructure. For this reason, he said, teaching the strategic aspects of information is paramount. The undergraduate program, in particular, aims to prepare students for careers as IT generalists. Recent graduates have taken positions in information

High-Flying Recruits

The FAA has found Syracuse University to be a fertile breeding ground for IS talent

At the U.S. Federal Aviation Administration's office of information technology, the ability to think analytically is a prized skill. FAA recruiters descended on Syracuse University's School of Information Studies (IST) a couple of years ago seeking to fill positions requiring knowledge of IT policy and planning, systems-architecture development, data administration and management, and hardware and software end-user support.

"Often, more-traditional IS programs produce students who are great technically, but they don't interact with people or understand the larger corporate view particularly well," said Elli Klein, management analyst for the FAA. "The reason we recruit at Syracuse is that we need people who have the strategic ability to see the big picture and who also have technical expertise."

"A critical success factor for industry and government is being able to work with customers effectively," said the FAA's CIO, Theron Gray. "In order to do that, [IS people] must have the interpersonal skills to be able to communicate and interact with customers and yet be able to provide technical advice as it's needed."

One recent FAA hire is Dani Levenson, a systems analyst who received her bachelor's degree from the IST in 1992. While at school, Levenson gravitated toward courses that emphasized the use, management and flow of information in organizations, rather than technical courses. (The curriculum did require Levenson to take a few technology-oriented courses, including programming and telecommunications.) Her interpersonal and problem-solving skills were honed in communication, organizational-behavior and logic classes.

At the FAA, Levenson sets up spreadsheets and databases and recommends seminars and subscription materials to end users. "It's a flat organization, so I interact with the management folks," she said. "I think the courses I took at school were a good preparation for the job world because I can go back and forth between technical and management issues." Levenson likes the fact that the knowledge and skills she gained in the classroom directly correspond to many of her job responsibilities. Her analytic skills and ability to work with others proved particularly helpful for a research paper she wrote recently that compares leasing versus buying PCs. She said the school's reliance on group projects also contributed to her ability to interact with others. *–M. Santosus*

systems and services, consulting, marketing, training, systems planning, management development and database management. "We form relationships with the organizations that recruit our students, and we actively solicit feedback from them," said Settel. "They are confirming that we are heading in the right direction in terms of giving students an understanding of the strategic needs and uses of information systems."

IN ADDITION TO THE theoretical study of information flow in organizations, the IST provides students with opportunities to gain practical experience through internship and cooperative-education programs. Both graduate and undergraduate students are encouraged to apply their classroom knowledge at organizations in a variety of industries. The programs are selective and typically involve considerable advance planning by students. Most sponsoring organizations prefer students with a minimum grade-point average of 3.0. Usually, only about 20 percent of eligible students participate at any given time. Undergraduate co-op participants write a research paper about their experiences.

Students receive school credit for their work as well as a regular paycheck and a head start on their post-graduation career paths. "I've learned a great deal about the mainframe since I've been here," said Brad Bunce, an IST senior who recently completed a summer co-op assignment at Harris Corp., a diversified electronics, communications and office-equipment company in Melbourne, Fla. "While working on applications with the systems-software group, I learned mainframe-based languages like SAS and JCL, and I eventually want to work in systems analysis and design." Other organizations that have recently hosted students include Sprint, IBM Corp., AT&T, Digital Equipment Corp., Merck & Co. Inc., United Parcel Service Inc. and the Federal Aviation Administration (FAA).

Some internships and co-ops lead to permanent employment. "We're looking for energetic, committed people who are interested in a future professional career," said Elli Klein, management analyst for the FAA in Washington (see related story, Page 75). "When we take on interns, we certainly have the intent of offering them permanent jobs if things work out." Lopatin so impressed his superiors during a three-month internship at EMI that the music company tracked him down a couple of years later and hired him away from another firm.

The future of the IST looks bright. Total enrollment for the graduate and undergraduate programs has expanded for the past five years and now stands at 600 students. According to Settel, people are much more aware of the bridge-position concept than in the past.

But potential students still need to be educated about the programs. In fact, many IST undergraduates initially applied to Syracuse's school of management and were placed in the IST by admissions staff after being turned down for the more-competitive program.

"Our major challenge right now is communicating to high-school students what the field of information studies is and why our particular program is so relevant for today's careers," said Settel. "Parents are usually very enthusiastic, but students have to be convinced that our program can lead to an exciting career." CIO

An Academic Sampler

THE UNDERGRADUATE PROGRAM *at Syracuse University's School of Information Studies concentrates on how individuals and organizations use information. Courses include:*

- **Introduction to Information Technologies:** A look at state-of-the-art technologies including computer architectures, telecommunications networks, and software design and applications.
- **Information Resources Planning:** An overview of planning, implementation and evaluation approaches. Students study different strategic, tactical, comprehensive and operational approaches.
- **Observations and Analysis of Information User Behaviors:** Methods for observing and evaluating user behavior when assessing information needs and designing system specifications.
- **Introduction to Information-Based Organizations:** Organizational theory and management practices including human-resources management, organizational development and managing change.

THE GRADUATE PROGRAM *has three tracks: management approaches and strategies, user information needs and technological infrastructures. Courses include:*

- **Research Techniques for Information Management:** An introduction to conducting, interpreting and utilizing research techniques from the perspective of IS professionals.
- **Telecommunications for Information Managers:** An overview of planning, design, implementation and evaluation of communications, and local- and wide-area networks.
- **Managers as Information Processors:** A look at management as an information-intensive activity—how people process information and make decisions; ways of defining and designing management systems.

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A Client/Server Interface

An object-based graphical user interface provides the perfect means for fully exploiting the client/server environment

BY JOHN EDWARDS

The forces of client/server computing and graphical user interfaces (GUIs) are on a collision course. At stake is the way end users access and utilize both applications and data. For management, the fusion of these two key technologies promises to have a major impact on a wide range of cost-related concerns.

While client/server systems offer end users a powerful infrastructure for obtaining and sharing information, GUIs can make using client/server technology easier and faster. As users become accustomed to working with GUIs on their standalone computers and elsewhere—in automatic teller machines, interactive cable TV and video games—companies will want to take advantage of the technology to increase productivity and cut training costs in a network setting as well.

All of today's leading computer platforms can accommodate a GUI—even venerable DOS- and Unix-based systems—and most new commercial applications offer GUI technology. The challenge for IS executives is to create and/or modify their own companies' client/server applications so that they can display corporate data in a GUI format.

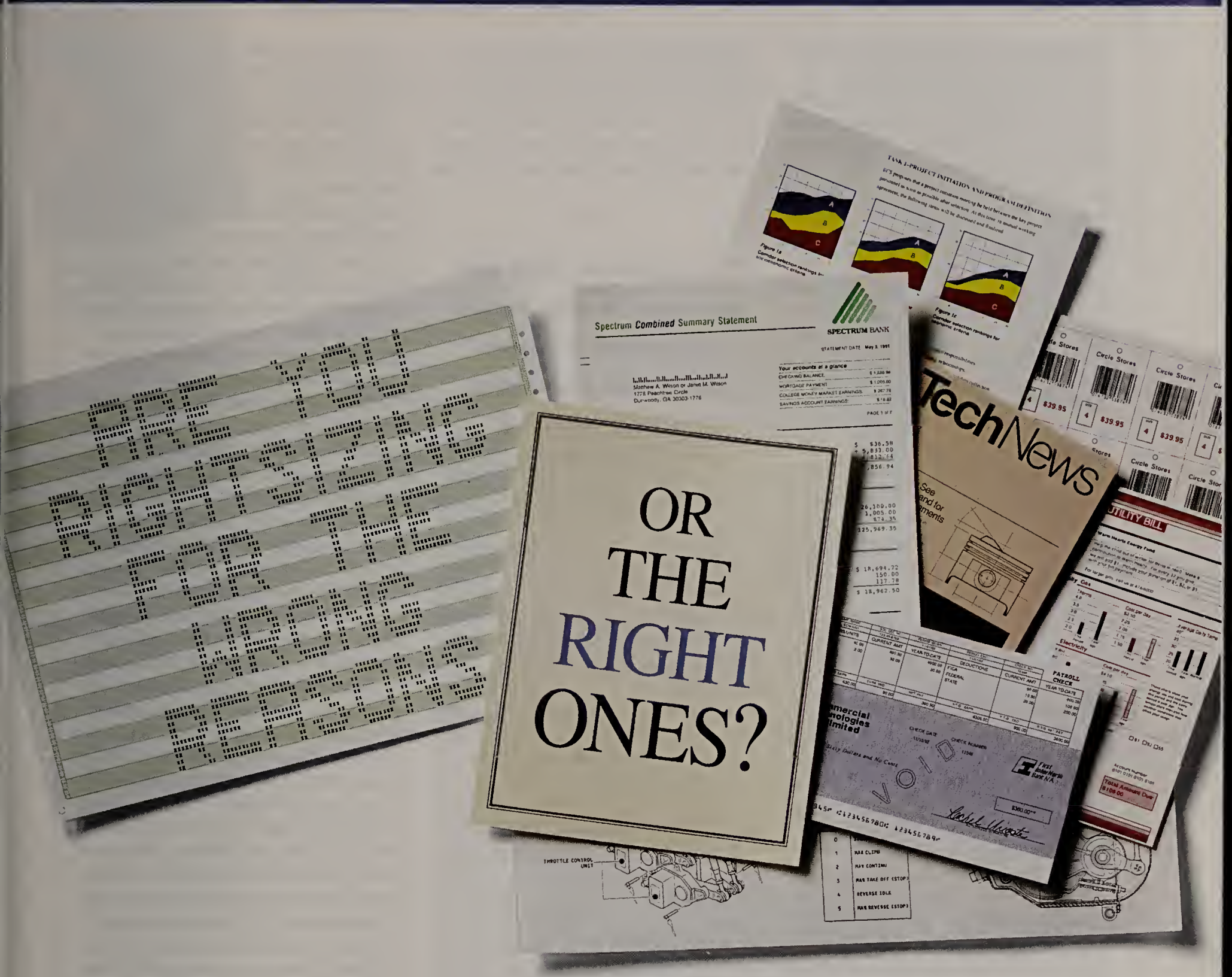
Besides offering end users a comfortable on-screen environment, GUIs can help them find files more quickly, better organize data and more efficiently move information among applications and across networks. They can also give users "the flexibility of in-situ editing without losing their place," said Bill Hines, president of Blue Sky Computing Corp. in New Cumberland, Pa. For example, if a user is working in a purchase-order application and notices that a vendor name is misspelled, he or she can pop up the vendor-maintenance application to make the correction. "The change is automatically communicated to and changed in the purchase-order application—which comes back to the forefront when the vendor application is removed." In many GUI installations, the application can come from anywhere on the network. "It could just as easily be Microsoft Word, Excel or any other Windows application that's popped up temporarily. Once the user gets used to that, there's no going back."

GUIs are as much a boon for developers as for end users. GUI-based tools give developers an established framework for their applications, according to William Beem, a former PC technical support manager with SunTrust Service Corp. in Orlando, Fla. "Certain rules exist for handling events [and] developing menus and other interface items," noted Beem. Most GUI-based tools also provide developers with access to sets of generic, predefined objects that they can insert into their applications to meet specific needs.

The first (and perhaps most important) step for ensuring success is assembling a GUI toolkit that meets a particular organization's needs. A

ILLUSTRATION BY ALAN MAZZETTI

XEROX



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company should choose its development language and platform with care, according to Ethan Winer, president of Ridgefield, Conn.-based Crescent Software Inc., a developer of programming tools for Microsoft Corp.'s Visual Basic. Winer noted that C, Windows and Visual Basic are leading language selections, but several application-oriented languages can be used to meet special requirements. The choice of a platform largely hinges on end-user needs, the tools and languages the developer is currently using, and the GUI development tools that are compatible with the first two considerations.

Commercial packages are preferable to homegrown programming tools for creating and installing GUIs, according to Winer. Skilled GUI developers can be difficult—and expensive—to hire, and less-skilled developers can cause time-consuming, project-wrecking delays. "Even if a programmer knows how to write GUI code, a commercial package will undoubtedly be more efficient," Winer said. He also noted that few programmers are familiar with the intricacies and quirks of development software.

The current GUI-tools market is segmented in a number of ways. Numerous vendors offer "all-in-one" packages for one or more specific platforms. Some tools—such as tool-bar utilities, icon libraries, installation and testing products, and developer and end-user training packages—are designed to meet a particular need. Most organizations eventually settle on a combination of a primary development tool, such as Visual Basic or Powersoft Corp.'s PowerBuilder, and a handful of special-purpose support utilities.

"A GUI is not just a command line with menus; it's a two-dimensional way of presenting information," said Ken Felder, a programming-tools specialist and vice president of marketing at One Tree Software in Raleigh, N.C. A key indicator of a GUI utility's usefulness is the way the product itself uses GUI technology. "A complex development environment [contains] a lot of information," Felder said. "The better development tools utilize the power of the GUI to represent that information in a more readily accessible and manipulable way than ever before.

"By themselves, GUIs don't have much to offer. The real productivity increases accrue with the addition of object-oriented capabilities."

–Ron Watson

The worst are reluctantly offering front ends to their clunky command-line technology or making things more complicated than they were before."

For a GUI to be of any practical use, Felder believes, it must enhance the user's ability to exploit the full potential of client/server technology, not limit his or her power in the cause of user-friendliness. When One Tree's design team created SourceSafe, a utility that manages developers' software projects, it concentrated on boosting developer productivity without limiting features or flexibility. The product has menu-driven interfaces for Windows, Windows NT and DOS. "It presents a lot of information in a very clean, well-organized, consistent way," Felder said. "And it offers more power—not less—in tracking source codes at the file and the high-level program and system levels."

GUI tool shoppers should pay close attention to a package's all-around capabilities, according to John Slade, president and CEO of Knowledge Garden Inc., a GUI-tools developer in Setauket, N.Y. Products that are strong in one or two areas often fall short in others. "It's no good having a great front end that leaves you in the soup when you want to do something serious," he said. Developers, like end-users, need a rich, high-level, object-oriented environment in order to work to their full potential.

GUI development tools must allow programmers to work logically as well. "These days," said Slade, "the user can lay out the design, discuss it with the developer and go around this circle until the interface is done." Knowledge Garden's KP-Win++ speeds development time by allowing developers to install application features and functions at the same time they are working on the interface, he said.

Ron Watson, chief designer and head programmer for Political Data Corp., a data-processing firm in Burbank, Calif., that maintains a statewide database of registered voters, agrees with Slade about the power of object-oriented technology for both developers and end users. With object-oriented capabilities, GUIs offer more than just a pretty face. "By themselves, GUIs don't have much to offer," Watson said. "The real productivity increases accrue [with the addition of object-oriented capabilities]. It's possible to communicate more-complex tasks to users with GUIs than with traditional interfaces."

GUIs also promote comprehension, according to Watson, because users learn more quickly and readily when they are given the opportunity to experiment. GUIs foster experimentation "by allowing users to customize the desktop to exactly the configuration they prefer," he said. "[This makes them] feel more possessive toward the system as a whole—it's theirs now."

But Watson also believes that GUIs pose dangers for organizations that enthusiastically embrace the technology without first making adequate preparations. "The pitfalls are mostly in the learning curve of the developers," he said. "Besides learning to use the new tools required to develop the GUI, developers must also learn how to translate the task to be done into the object-oriented paradigm. It's not an easy shift to make, but once done and once the toolbox is built, I think it actually becomes easier in some ways to build a good user interface."

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Developers should beware of empty promises made by some GUI toolmakers, according to Slade. "Many of the high-level tools give the promise of interactive development but then leave the developer with a 'long drop to the C' once the basic interface is done and it's time to implement some logic."

Some vendors require customers to buy separate run-time licenses, or charge stiff royalty fees for distributed applications. Without adequate planning, companies may find themselves needlessly buying GUI tools with overlapping capabilities. Instead of acquiring tools on an ad hoc, as-needed basis, IS managers should look at the big picture and plan for tool needs that are likely to arise in the future.

GUIs do not always increase productivity, said Denise Kirschner, database manager for university relations at St. Bonaventure University in St. Bonaventure, N.Y. In certain key areas, they can actually decrease productivity and increase costs. "If you're simply interested in time-motion benefits for repetitive tasks, GUIs aren't the way to go," she said. GUIs slow down data-entry work, for example. "With a GUI, users are going from having both hands on the keyboard at all times to switching a hand off the keyboard every now and then to move a mouse or other pointing device. Also, without a GUI...the user doesn't have to look up at the screen to see where the pointer is."

GUIs may also require faster processors and more storage space, Kirschner said. Despite the disadvantages, Kirschner is planning to move her shop over to the technology within a year. "For training purposes and for getting new users up to speed on an application, you can't beat a GUI environment," she said. "It also makes it easier to work with prepackaged applications that are only available in a GUI format. Why swim against the tide?"

IS managers should pay close attention to both the documentation that comes with GUI tools and the documentation they plan to provide with their own in-house applications, according to Fabian Pascal, a database consultant and trainer in Palo Alto, Calif. "It's much more difficult to explain how things work in an event-driven, picture-oriented, encapsulated environment," he said. "We're going back to ancient Egypt and the hieroglyphs—many of the iconized screens in Windows look exactly like that. They are equally hard to decipher."

How will the GUI-tool market evolve over the next several years? Most vendors and users foresee a groundswell movement to greater cross-platform support. Already, many users are demanding development tools for consistent GUIs that can be ported to a wide range of networked platforms.

IS professionals can be sure of one other thing, experts say: GUIs will eventually replace character-oriented environments. CIO

John Edwards is a freelance writer based in Mt. Laurel, N.J.

GUI Development Tools

There are several hundred GUI development tools now on the market, many designed to fill a specific niche. The following are some of the better-known general-purpose products.

COMPANY & LOCATION	PRODUCTS
AimTech Corp. Nashua, N.H. 800 289-2884; 603 883-0220	**IconAuthor:** Multimedia authoring system that can be used to develop computer-based training, performance-support systems, self-service kiosks and other GUI-oriented applications
EASEL Corp. Burlington, Mass. 617 221-2100	**EASEL Workbench:** A visual tool suite for building enterprise client/server applications
IBM Corp. Armonk, N.Y. 800 426-3333; 914 765-1900	**OS/2 Application Development Tools:** Development tools for OS/2 2.0, including a screen design aid and other GUI-oriented utilities
Inference Corp. El Segundo, Calif. 800 322-9923; 310 322-0200	**ART*Enterprise:** Object-oriented development tool featuring GUIs with multimedia authoring capabilities
Knowledge Garden Inc. Setauket, N.Y. 516 246-5400	**KPWin++:** Provides an object-oriented programming environment for Windows and includes a full set of visual design tools
Microsoft Corp. Redmond, Wash. 800 426-9400; 206 882-8080	**Visual Basic:** Graphical application-development product that combines a visual design toolkit with a programming language **Windows Software Development Kit:** Development toolkit for Windows
Neuron Data Inc. Palo Alto, Calif. 800 876-4900; 415 321-4488	**Open Interface:** Object-oriented GUI toolkit for various platforms
NeXT Inc. Redwood City, Calif. 415 366-0900	**NextStep:** Object-oriented GUI operating system and development package
Powersoft Corp. Burlington, Mass. 800 635-2567; 800 395-3525	**PowerBuilder:** Allows users to add graphical front ends to client/server applications, particularly databases
SunSoft Inc. Mountain View, Calif. 800 227-9227; 415 960-3200	**OpenWindows Developer's Guide:** Helps users design a 3-D OpenLook GUI for their applications

FRONTLINE

BY PORTIA ISAACSON

For notebook users with a yen for increased functionality, hard drives, memory expansion, modems and more are only a PC Card away

Why You Need the Card

HOT SLOTS!

Call your techies. Call your computer buyers. Don't purchase another notebook computer if it doesn't have PCMCIA PC-Card slots.

Why should CIOs, whose precious time is consumed with strategic IT plotting, brilliant boardroom displays and endless legacy burial ceremonies, concern themselves with such trivia? If your enterprise is like most I know, a stampede is underway to purchase notebook computers. In 1992, 2.7 million take-along computers—including notebooks, laptops, handhelds and palmtops—were purchased in the United States. Eventually, 90 million individuals in this country will own at least one nomadic computer.

Besides portability, what do Hewlett-Packard's OmniBook 300, AT&T's EO 440, Apple's Newton, NEC Technologies' UltraLite Versa, Toshiba's T4500, AST's PenExec 3/25 and IBM's ThinkPad have in common? They don't use the same operating system. They don't even feature compatible microprocessors. Some have keyboards and others use pens. The feature these nomadic beauties do share is a PCMCIA (Personal Computer Memory Card International Association) PC-Card slot that allows users to expand functionality by adding one or more of the 200 PC Cards now available. Some computers offer more slots than others. Some offer them more cleverly than others. And some offer more compatibility and interchangeability than others.

By the simple insertion of a PC Card into an accommodating slot, a notebook computer can be connected to Ethernet, token-ring, wireless LAN, wired-telephone, cellular-telephone, paging and data-broadcasting networks.

PCMCIA PC Cards solve a variety of problems and enable some futuristic applications. By the simple insertion of a PC Card into an accommodating slot—easier than inserting an ATM card into a money machine—a notebook computer can be connected to Ethernet, token-ring, wireless LAN, wired-telephone, cellular-telephone, paging and data-broadcasting networks. A PC Card will even enable the sexiest notebook computers to emulate a 3270 terminal. PC Cards that bear a remarkable resemblance to my Citibank VISA card can expand a notebook computer's memory beyond my credit limit. Hard-disk drives can be added. Programs or data can be made available like Nintendo cartridges. You can purchase PC Cards that offer no more than a simple serial or parallel connection. And if you can't live without a small computer system interface (SCSI), it is only a PC Card away.

My favorite PC Card is a Global Positioning System (GPS) receiver, manufactured by Trimble Navigation, which enables a notebook computer to receive data from the U.S. Department of Defense's $12 billion system of 24 satellites. With this information, users always know their precise location in terms of longitude, latitude, altitude and the time at which these spatial coordinates are reported.

Why would such information be important? Florida Power & Light Co.'s line inspectors record power-line problems along with their exact GPS earth coordinates. A line crew is then dispatched to the exact spot—a far more precise and efficient method than making marks on maps, which are frequently out of date. The company plans to use GPS-equipped computers in disasters like Hurricane Andrew to guide emergency line crews from other states to the site of the problem.

Out of the Dark Ages

BIRTH OF A STANDARD

Back in 1988, the dark ages of nomadic computers, manufacturers of notebooks and palmtops took proprietary approaches to whatever meager expansion their products offered. Ordinarily, users had to take their notebook computers back to the dealer if they wanted a modem or memory card—or risk never getting them put back together. Users accustomed to expanding their ISA-bus desktop computers at will—albeit with screwdriver, IRQ cheat sheet and interrupt-conflict headaches—were frustrated by unexpandable notebooks. The smaller the computer, the bigger the problem.

Poqet, now Fujitsu Personal Systems, pioneered the palmtop computer. Its programs (Lotus 1-2-3, for example) were on ROM cards, and its memory was expandable with memory cards. Recognizing the need for a credit-card-sized memory-card standard, Poqet worked with its memory-card supplier, Fujitsu, to organize a meeting of 30 companies including semiconductor, software, disk-drive and computer firms. The creators of PCMCIA had no intention of limiting the organization to producing a standard for memory cards only.

PCMCIA was founded by John Reimer, who was then Fujitsu's memory-card mar-

keting manager and is now chairman of PCMCIA and an entrepreneur. The first standard, PCMCIA 1.0, was just for memory cards, but it was soon followed by release 2.0, which supports disk drives and peripherals (such as modems, GPS receivers and scanners) with an almost unimaginable level of diversity.

From the beginning, PCMCIA worked with the Japan Electronics Industry Development Association (JEIDA), which already had a memory-card standard in the works. The PCMCIA and JEIDA standards are identical, enabling the same small packages of electromechanical wonderment to be used in computer, consumer-electronics and instrumentation products. Within just a few years, your 300MB hard-disk drive will move as easily from your camera to your Apple Newton to your desktop Windows NT workstation as a floppy disk today moves from a DOS computer to a Macintosh with an Apple Superdrive and DOS Mounter. More easily, probably, once all the kinks are out of the cross-platform implementations of the standard, and once Apple has accepted that it is OK to be just like everyone else where PCMCIA is concerned.

(Dear Apple—I heard that at the most recent consumer-electronics show you announced that you were going to initiate a change in the name "PCMCIA," presumably because you think "PC" suggests DOS rather than the generic personal computer. Don't you have better things to do?)

Because the PCMCIA PC-Card standard was needed so desperately by the market, leading companies quickly adopted it. I think it holds the record for the shortest time between standard-drafting and widespread adoption. No small credit goes to the not-for-profit association itself, which was run like an entrepreneurial business by Brendon McGuire, its nonstop executive director.

ILLUSTRATION BY MARY ANNE LLOYD

Creating Compatibility

WHAT IS THE PCMCIA STANDARD?

The PCMCIA standard specifies the mechanical and electrical as well as software interfaces for PC Cards, which can be either memory or I/O cards. The standard specifies a 68-pin connector and, believe it or not, provides for insertion and removal of cards while the computer is operating (this is called "hot" insertion—no rebooting is required).

PC Cards come in three sizes. All are credit-card size in length and width but differ in thickness: Type I is 3.3 millimeters, Type II is 5 millimeters, and Type III is 10.5 millimeters. Type I cards are typically memory cards; Type II cards, modems; and Type III cards, hard-disk drives. Handheld computers and personal digital assistants, which must be very thin, typically come with Type II slots that will accommodate a Type II or a Type I card. Notebook computers, which are thicker, come with Type III slots that can accommodate all sizes. Clever notebook-computer designers (such as Renee Bader, NEC's product manager of strategic marketing) have created slots that can accommodate one Type III card or two Type IIs or Type Is in the same space.

The PCMCIA standard, believe it or not, provides for insertion and removal of cards while the computer is operating (this is called "hot" insertion—no rebooting is required).

Although all PCMCIA cards are mechanically and electrically compatible, further compatibility and interoperability depend on software magic. BIOS suppliers, especially SystemSoft in Natick, Mass., are providing computer manufacturers with the basic system software required to support PC Cards (Card Services and Socket Services, for example). Application-software compatibility and availability to support a specific PC Card (such as a GPS application) must be assured by the user when purchasing the application and the software.

Intel's Exchangeable Card Architecture (ExCA) makes the PCMCIA standard more specific for X86-architecture computers and enables complete PC-Card interoperability. With ExCA, a PC Card can be added and removed even while the computer is on. This capability is called QuickSwap, a moniker offered to PCMCIA by NEC. Intel has offered the ExCA standard to PCMCIA so that it may actually become a part of the PCMCIA standard. This offering up of standards and names by members is not unusual in the history of PCMCIA. Even the name "PC Card" came from IBM, which sold the association all rights to the term.

Apple, AT&T and others can easily create platforms that are mechanically and electrically compatible with PC Cards. But when it comes to interoperability, they are at a disadvantage, because their architectures are so fundamentally different from Intel's X86. However, PCMCIA is hard at work extending the standard to accommodate other architectures.

The day may come when any PC Card will work on any computer, unless it requires more power than the

computer can muster (a hard-disk-drive PC Card requires too much power to operate on an AA-battery-powered handheld computer).

An Expanding Role

THE FUTURE IS IN THE CARDS

Although PCMCIA insists that its PC-Card standard should stay nomadic-centric, desktop manufacturers are adopting it (IBM and Siemens/Nixdorf showed desktop systems at the recent CeBIT). So PCMCIA is extending its standard to accommodate desktop supporters (Sun, for example, wants more power). Why would these companies use PCMCIA PC Cards for expansion rather than the bus cards they use today? First, the functionality that required an entire ISA bus card a few years ago, or even a bus card and a disk-drive bay, now fits on a PC Card, thanks to improvements in the density of semiconductors and hard-disk drives. This development allows for much-smaller-footprint desktop computers. Secondly, PC Cards are easier to install than ISA-bus cards—the process is much like inserting a floppy disk. Finally, users who purchase PC Cards will want to use them on their desktop computers as well as on their nomadics.

The day may come when any PC Card will work on any computer, unless it requires more power than the computer can muster.

Much of the computer industry can expect yet another change caused by PC Cards. There are hundreds, if not thousands, of computer add-in board manufacturers: Any hot-shot electronics designer with ORCAD on his or her PC and a few dollars to buy semiconductor chips and have a board etched can launch an add-in board business. These entrepreneurs have been key enablers of the diversity of PC applications. When PC Cards dominate the computer-upgrade market—which they will eventually—the power will belong to semiconductor manufacturers and others that can afford large runs of highly integrated electronic and mechanical components that must be manufactured to the highest-quality specifications. IBM, for example, has been a pioneer in PC-Card manufacturing; it not only sells PC Cards under its own label but is a leading supplier of PC Cards sold by other companies.

Of the 200 PC Cards available today, most are basic. They include memory of all kinds (such as flash memory), application programs (Microsoft Excel and Word), Ethernet (IBM), token ring (Xircom), modems (AT&T Microelectronics), wireless LANs (Proxim), disk drives (MiniStor) and cellular communications (Nokia). Not-so-basic PC Cards include GPS receivers (Trimble Navigation), 3270 emulation (IBM) and wireless communications (Motorola).

There are some cards I can hardly wait to get. My shopping list includes a PC-Card interface to a highlighter-size scanner, a PC Card that scans and recognizes business cards, a business audio card with microphone and speaker connectors, a VGA port (I've heard that this may not be possible with the current PCMCIA standard), a handwriting-recognition processor, a language translator, an infrared (IR) port compatible with H-P's proposed standard, an IR transmitter compatible with my TV and VCR, an adapter with software to control a robotic toy, a human vital-signs monitor, an interface to my car to collect statistics and... stay tuned—I feel a bad case of technolust coming on.

Words of Advice

WISE BUYS

Only once have I seen a CIO cry—well, nearly cry. About 18 months ago, a CIO from a large European firm was visiting me in my Cambridge, Mass., office. I showed him a PC-Card mock-up that had been furnished by the PCMCIA and a 1.3-inch H-P Kittyhawk Personal Storage Module hard-disk drive and explained how, within a couple of years, these little cards would house 100MB disk drives. Where you have 100MB drives, you can be sure to have gigabyte drives in less than a decade.

This upset the CIO because he saw the future. All his efforts to control PCs and nail down enterprise data would be for naught. He had visions of credit-card-sized gigabyte drives leaving his company in handbags and shirt pockets. He saw laundered data. He realized that he needed a dramatically new plan based on different assumptions. He was glad he is retiring soon.

PCMCIA is extending its standard to accommodate desktop supporters.

If you are not retiring, there are a few things you should know when purchasing PC Cards and computers with PC-Card slots. First, don't expect PC Cards purchased for X86 notebooks to work with Apple's PCMCIA PowerBook or Newton, or AT&T's EO—although they might. You can, however, expect that X86 cards will work across most X86 notebooks (Toshiba, NEC, Compaq, IBM). Be sure that any X86 computer you purchase has a BIOS that is upgradeable (in flash memory, not ROM), because incompatibilities will soon be fixed by BIOS software upgrades. I would purchase a notebook with a BIOS, Card Services and Socket Services from SystemSoft, the leader in attaining PCMCIA compliance.

Until the future comes, always ask about compatibility. Each computer manufacturer maintains a list of PC Cards its products work with, and each PC-Card manufacturer is maintaining a list of computers its products work with. Do not accept generic answers. Ask for a specific manufacturer name and model number, and be sure that each combination of interest has been tested. IBM, for example, has been aggressive in testing its PC Cards across a wide variety of computers.

To learn more about PC Cards, I recommend *IC Card Systems & Design* magazine, the PCMCIA exhibits at leading PC trade shows and John Reimer's educational video published by Market Vision in Campbell, Calif. CIO

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FYI

Teacher's Pet

If the dust bunnies in your office building are multiplying at a more rapid pace than your employees' productivity, it could be time to bring in Integrated Applications Inc.'s audio-cassette-based training unit. Iadat uses sight, sound and touch to cultivate learning, which can be stymied by poorly written user manuals or overworked supervisors who have no time to train employees on the computer system.

Users watch and listen—at their own pace—to a training program on a computer while an instructional tape plays along. The program simultaneously records all keystrokes, screen action and verbal comments and questions made by the users so that supervisors can later review users' progress. Compatible with asynchronous RS-232 terminals and MS-DOS PCs, the recent version of Iadat features a universal power supply. Iadat can be used for any type of hardware training, and because it uses standard audio cassettes, programs can be revised easily to accommodate companies' changing policies.

Iadat requires less up-front development time than alternative methods (one to 10 hours for every hour of instruction, compared with a 200-to-1 ratio for computer-based training), according to the company, and less time and expense during training. The portable unit weighs 11 pounds and is shipped with all required accessories, including cabling, microphones and connectors. A single unit costs $2,600. For more information, call 800 637-7890.

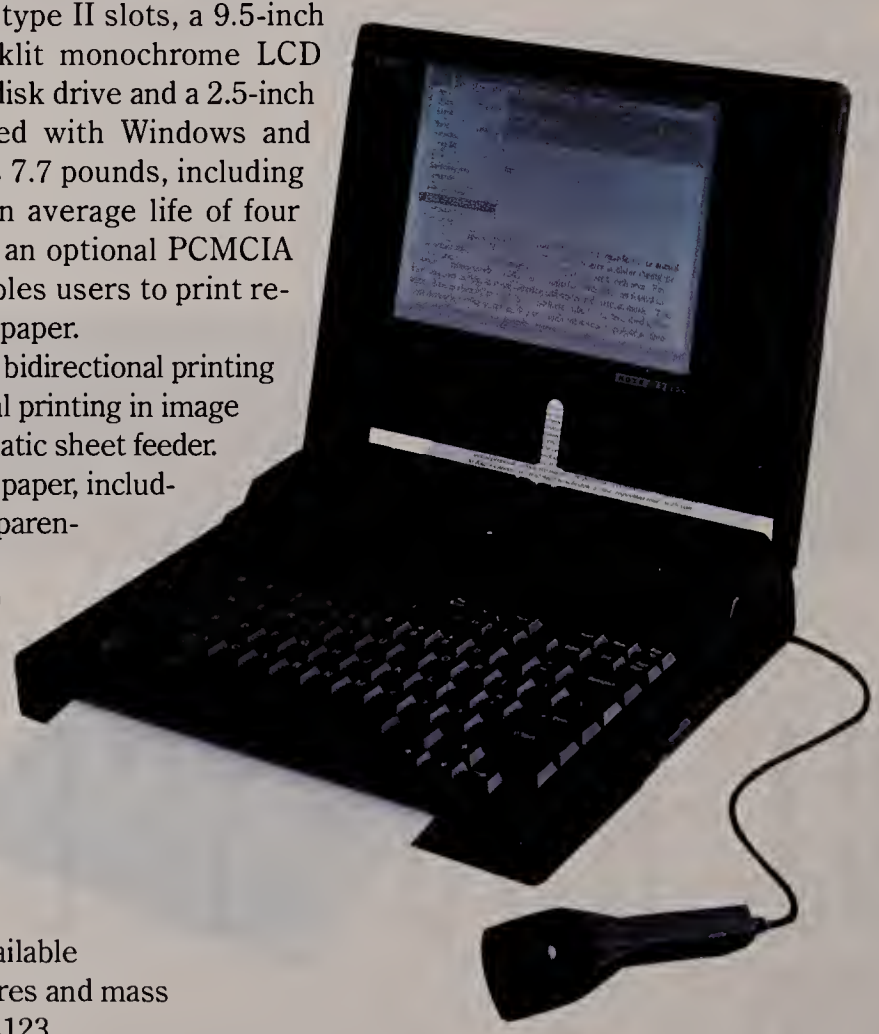
Printer for the Mobiles

Notebook computers are a blessing to mobile workers who absolutely, positively need access to certain files to get the job done. But the drawback to such computing is the lack of printing facilities—until now. Canon Computer Systems Inc.'s NoteJet 486 includes a built-in Bubble Jet printer that features a resolution of 360 dots per inch.

The NoteJet features 4MB of RAM (expandable to 12MB), two PCMCIA type II slots, a 9.5-inch video graphic array backlit monochrome LCD screen, a 3.5-inch floppy-disk drive and a 2.5-inch hard-disk drive. Equipped with Windows and DOS, the product weighs 7.7 pounds, including the battery, which has an average life of four hours. Canon also offers an optional PCMCIA data/fax modem that enables users to print received facsimiles on plain paper.

The Bubble Jet features bidirectional printing in text mode, unidirectional printing in image mode and a 10-page automatic sheet feeder. And it prints on all types of paper, including labels and Canon transparencies. The replaceable print head prints roughly 23,000 pages, and the ink cartridge prints about 65 pages.

An 85MB version costs $2,499, a 135MB unit is $2,799, and a 180MB version costs $2,999. The NoteJet is available through dealers, superstores and mass merchants. Call 800 848-4123.



Needle in a Haystack

Anyone who can type an English sentence can now find what they need in full-text databases without manually building or maintaining topics and knowledge bases, according to ConQuest Software Inc. ConQuest's concept-based search-and-retrieval system for the Notes environment combines linguistic and statistical processing and provides a dictionary-derived semantic network of 250,000 concepts and 3 million word links.

ConQuest provides access to archival information within Notes documents and databases as well as external sources. It filters and routes real-time news feeds, automatically routes Notes documents and performs intelligent message handling. The system's concept-related hypertext links enable users to retrieve related terms and concepts as well as exact matches.

Prices begin at roughly $1,000 per user for a 10-user configuration and go down from there. For information, call 410 290-7150.

Disk Jockey

Is there clutter in your computer room? Hitachi Data Systems released a disk-storage series for the IBM-compatible mainframe market that takes up one-third less floor space. The 7600 family, consisting of the 7690 Disk Storage Controller and the 7693 and 7699 Disk Arrays, is based on a 6.5-inch form factor disk drive.

The controller features an intelligent learning cache algorithm and improved bandwidth of 50 percent over the previous generation of controllers. It can address 16 times more logical paths—256—than any controller currently available, according to Hitachi, and cache memory can be expanded to 1GB. The 7693 and 7699 Disk Arrays provide up to 90GB and 270GB in one frame, respectively. Prices for the 7690/7693 subsystem range from $425,000 to $2 million. For information, call 408 970-1000.

CIO

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Drilling for Data

Keeping one of the world's largest offshore oil platforms up and running requires collecting and analyzing tens of thousands of points of machine data

Before automation, maintaining the equipment on an oil platform was hardly an exact science. Technicians with the old-fashioned kind of notebooks walked around and manually recorded performance data—such as vibration or pressure readings—from various gauges, dials and meters. Although the measurements could indicate a problem, they offered little insight into the problem's cause.

When Sonat Offshore Drilling Inc.'s Ron Dailey became maintenance supervisor for one of the world's largest platforms, located in 2,806 feet of water 214 miles southwest of New Orleans in the Gulf of Mexico, he wanted to find a more rigorous way of keeping tabs on the equipment. At full capacity, the nearly completed tension-leg platform will produce 40,000 barrels of oil a day. Between 30 and 40 maintenance workers will need to monitor 24,000 points of data for thousands of pieces of equipment.

Charged by management to keep costs down, yet encouraged to be innovative, Dailey turned to integrated, PC-based, predictive-maintenance applications from PdMA Corp. of Tampa, Fla. Now he and his maintenance crew have the comprehensive data they need to prevent catastrophic failure and help keep the rig in working order.

PdMA, formerly Halliburton NUS Environmental Corp., provides Sonat with a variety of maintenance services, including analysis of machinery lube oil and vibration, and infrared scanning of electrical equipment that can detect the "hot spots" or loose connections that cause equipment to fail.

Currently, PdMA consultants use handheld devices to collect data on-site. (Schedules vary: Vibration is checked every 90 days; lube oil is tested every 1,000 hours of operation; thermographic studies are done annually.) They analyze the findings against preset tolerances and recommend solutions if problems exist. These results are transferred from the handhelds to a 486-based PC running an integrated software package from PdMA called VISION. VISION continuously reviews and compares maintenance histories and generates reports when exceptions are detected. When Sonat staff take over the collection process, the data will be sent electronically to labs in Tampa for analysis.

Previously, in order to detect exceptions, maintenance staff had to know what the acceptable parameters were for each piece of data collected. Historical information was stored temporarily on a minicomputer, then dumped after a few days. Beyond that, historical data could only be found by looking through a lot of paper.

Now technicians are notified automatically when data falls outside acceptable parameters, and comprehensive maintenance histories for particular pieces of equipment are quickly available. This has reduced human error and improved troubleshooting considerably.

"The software integrates all the data that was separate before, so we can look at a piece of equipment on the system and compare the results from all the [analyses]," said Dailey. "This helps us locate the problem quickly." Results can be charted, providing maintenance staff with a quick and visual way of detecting trends and locating problems. Similar pieces of equipment or systems can be compared on the same chart as well.

While predictive maintenance services were available before, Dailey said, having the data readily available on the oil platform in an easy-to-use, menu-driven format represents a big improvement over previous methods employed by drilling concerns.

"Before, service companies would perform an analysis and then leave with all the data," Dailey explained. "A couple of weeks later they would send reports and photos, but we couldn't really use them to determine trends."

According to Dailey, the new system has saved his crew a lot of unnecessary work. "Predictive maintenance and condition monitoring is the cheapest way to go because we don't have to take any equipment apart to test it, and we can detect a small problem before it becomes a big problem."

–Megan Santosus

VITAL STATISTICS

Organization: *Sonat Offshore Drilling Inc., Houston*
Application: *Predictive-maintenance systems*
Sponsor: *Maintenance Supervisor Ron Dailey*
Technologies: *Software from PdMA Corp. running on a 486-based PC and handheld data-collection devices from SKF Condition Monitoring*
Scope: *Technicians and mechanics*
Objective: *Reduce costs and time spent on equipment maintenance*
Payoff: *About 30 percent fewer employees needed to maintain equipment; system provides more-detailed monitoring, faster turnaround of test results and access to historic data; maintenance crew less likely to commit judgment errors*

"The move to the desktop by our mainframe-based clients is an excellent first step in the transition to client/server computing."

Tim Nelson, Chief Scientist of System Development Environments, SHL Systemhouse.

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